American Machinist

Volume 57 NEW YORK, DECEMBER 14, 1922 Number 24

Repairing Locomotives in a Milwaukee Shop

Modern Production Methods Applied in a Locomotive Repair Shop—Uses of the Electric Welding Machine and Gas Torch—Time-Saving Devices

By HOWARD CAMPBELL
Western Editor, *American Machinist*

ALTHOUGH railroad repair shops as a rule are not noted for their modern methods, the West Milwaukee shops of the Chicago, Milwaukee and St. Paul Railway are keeping up with the times both as to methods of production and in handling the work. Material is ordered and delivered in a systematic manner, and

FIG. 1—WELDING SMOKE-BOX RING INTO FIRE-BOX

the old idea of setting up a machine where there was the most space has been discarded for the modern system of grouping. All the machines that are necessary for the machining of any of the major parts are arranged so that the operations can be performed in sequence.

Instead of the machinist or his helper going to the stock room for material, he simply notifies the foreman. The latter makes out an order and drops it into a box attached to his desk. A stock-boy collects these orders every half-hour and within the next half-hour the material is delivered to the machine by a laborer from the stock room.

Another interesting feature of this shop is that the customary method of having parts forged in the blacksmith shop is being largely discarded. Patterns have been made for most of the parts that comprise the link motion and steel castings for these parts are now kept in stock. As the castings are made exactly to size where no machining is required, the expensive forging operation and a great deal of unnecessary machining is saved.

Another saving, and certainly a most sensible one, is assured in the making of drive-bolts. These are turned out of round bar stock, the material being of sufficient diameter to leave a head of the desired size. The stock is much cheaper and the round head, for this purpose, is just as efficient as a hex or square head. If the bolt is loose enough, so that a wrench would have to be used to hold it from turning, it is too loose to use in a place where a drive fit is required. These bolts are used in all places where drive fits are necessary.

Many of the parts that formerly were riveted are now spot-welded together, an electric arc-welding machine being used for this purpose. In Fig. 1 is shown the operation of welding the smoke-box ring into

FIG. 2—BLANKING OUT MAIN ROD WITH GAS TORCH

the front end of a locomotive fire-box. The machine is a Burke Electric Arc-Welding machine, using a current up to a maximum of 200 amperes at 50 volts. The seam is welded both inside and outside, a ¼-in. iron wire being used to make the weld. This makes a much smoother looking job than the old method of riveting and saves the time of drilling the holes and heading the rivets. The time required for riveting in a smoke-box ring was approximately five hours and required the time of four men. One man can easily weld a ring in alone, doing the job in six hours. Door-sheets and flue-

sheets are also welded in instead of being riveted, saving 50 per cent of the time formerly required to assemble these parts. The hopper is welded into the ashpan, using an arc-welding machine made by the C. & C. Elec. Mfg. Co. The current is transformed down from 220 volts to 45 volts, 600 amperes. Scrap strips of boiler plate are used for the welding material. It once required from 15 to 18 hours to rivet a hopper in place but now the welding operation takes approximately three hours.

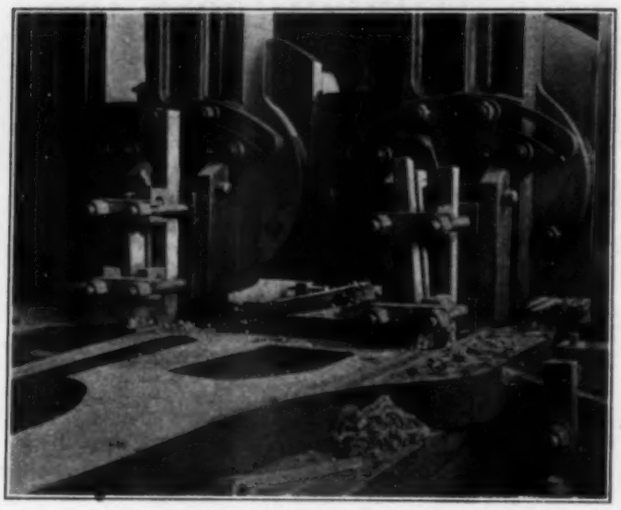


FIG. 3—USING MULTIPLE TOOLS ON PLANER

The acetylene gas torch also has its place in this shop. The operator, shown in Fig. 2, is cutting out or "blanking out" the end of a main rod, using a gas torch with a cutting tip. The rod is laid out and two holes are drilled at the inner corners of the block, these holes forming the radius necessary in the corners. The rod shown in the illustration is 5½ in. thick and the average time required to cut out the block is 15 minutes. This operation used to take five hours on the slotter. The finishing operation is done on the slotting machine and takes the same amount of time as before, about 3½ hours. Immediately after the block is cut out, and while the rod is still hot, the rod is thrown into the box just the other side of the operator and the hot ends are covered with asbestos, so as to prevent oxidation and the resultant hardness.

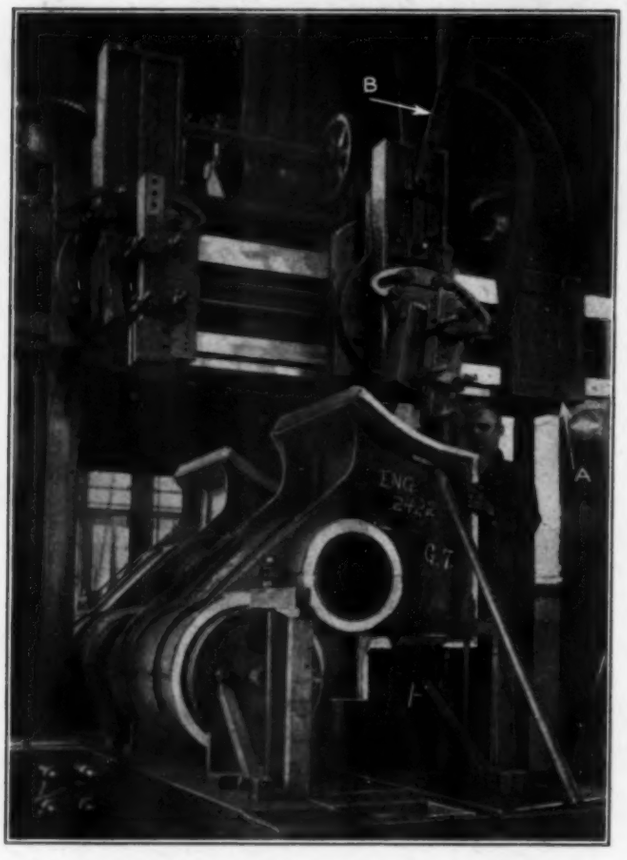


FIG. 4—PLANING RADIUS ON CYLINDER CASTINGS

That this shop is keeping up with modern ideas of production is evidenced by the use of multiple tools on the planer shown in Fig. 3. The operation is that of planing the side of a locomotive frame. Eight tools are in operation simultaneously, one on each upright of the planer and three in each of the heads on the cross-rail.

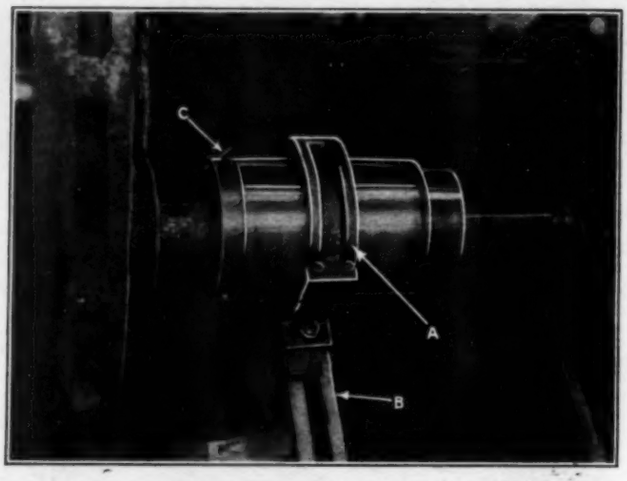


FIG. 5—CRANK-PIN TURNING ATTACHMENT

Two of the three tools are set in tandem, each tool taking half of the roughing cut. The third tool is a finishing tool.

Another interesting planer job is shown in Fig. 4. Here the operation of planing the radius on a cylinder casting is shown, using an attachment by which the desired radius is cut as the head feeds across the machine. The arm *A*, which is of cast steel, is attached to the cross rail and the strap *B* is attached to it and to the toolslide as shown. As the cut proceeds across the piece, the strap swings on the bolts and the slide is gradually raised, describing an arc as it does so and cutting the desired radius on the casting. This saves the work of feeding the tool up by hand and makes a practically perfect job. The radius can be cut on a pair of these castings set up in tandem as shown in nine hours. This operation used to be done by hand chipping, which took 40 hours, and later by using an air hammer and chisel, which took 20 hours.

Another tool that saves a great deal of time and labor is the crank-pin turning attachment shown in Fig. 5. The attachment consists of a steel sleeve 12 inches in diameter and ¾ in. through the wall, attached by means of machine screws to a head on which a shank is turned. The shank fits into the spindle-sleeve of a quartering machine. The sleeve turns in the journal *A* which is attached to the support *B*. The tool, shown at *C*, is of ½-in. high speed steel. The tool has to be set to turn the pin to the desired diameter. As the work

has just been changed, the tool shown in the illustration is not set for the pin shown. When the machine is in operation, the sleeve feeds along at the rate of $\frac{1}{32}$ in. per revolution, turning at a rate of 12 r.p.m. The use of this attachment eliminates the necessity for pulling out the pin in order to turn it in a lathe as was formerly done.

A set-up for milling the flutes in spiral reamers and

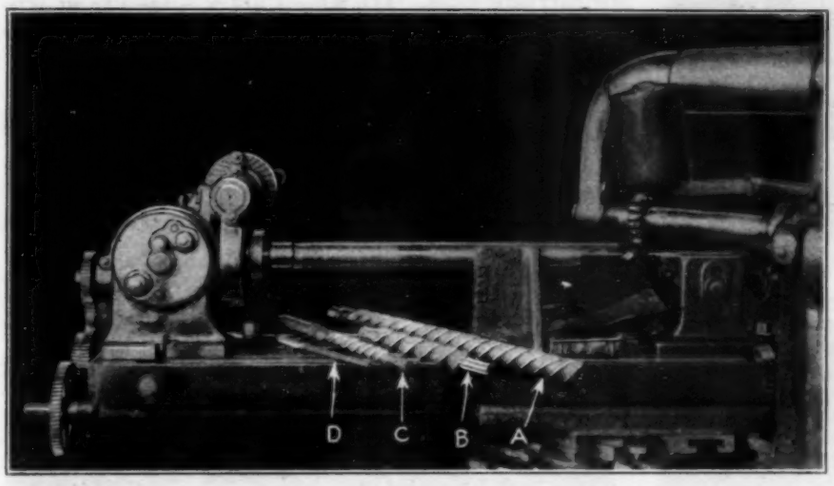


FIG. 6—MILLING FLUTES IN SPIRAL CUTTERS

milling cutters is shown in Fig. 6. After a series of experiments, it was found that the best results were obtained by using reamers and cutters with left-hand spiral flutes. The reamers produce nice holes and practically never stick in the work, something that cannot be said of straight reamers nor of those with a very gradual twist. Large "bites" are impossible. The largest reamer, *A*, is a frame reamer, used for reaming the frame splice. The next tool, *B*, is a cutter used for milling the jaws in the side rod, as shown in Fig. 7. The third one, *C*, is for milling the keyway in the piston rod, and the fourth, *D*, is a standard taper pin reamer.

The cutter used for milling the fork end of the side rod, as shown in Fig. 7, is eight inches long and $1\frac{1}{4}$ in. in diameter. The cutter feeds in on the top of the slot and out on the bottom, making a smooth job. The time is $2\frac{1}{2}$ hours as compared to the old time of $3\frac{1}{2}$

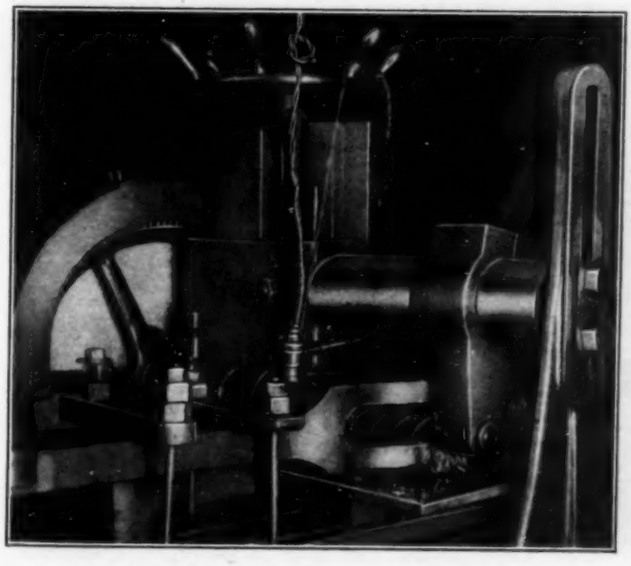


FIG. 7—MILLING FORK END OF SIDE ROD

hours on the slotting machine. An application of a universal joint to a reamer is shown in Fig. 8. The joint is so simple that no explanation is necessary. By using this, the necessity for perfect alignment of the work with the spindle is eliminated, thereby saving a considerable amount of time. The job shown is that of reaming out the bearing hole in a link-cheek.

A jig for drilling the holes in a jet nozzle for a standard stoker is shown in Fig. 9. The piece is locked into the box *A*, which swings on pins, one on each end. Plate *B* contains a bushing through which nine $\frac{1}{8}$-in. holes are drilled, one at a time. Each hole is located by the use of the spring-pin *C*, which slips into each of a series of holes in the end of the box, as it is swung around.

After these holes are drilled, pin *C* is pulled out and locked and spring-pin *D* is slipped into a hole, holding the box central while three holes are drilled through the plate *E*, and three more through a similar plate on the other side of the jig. After this the jig is turned bottom up and pin *D* is slipped into a hole which brings the two holes *F* in line with a pair of bushings in the bottom of the jig. The jig is shown in this position in the photograph, although it hasn't been turned over. The amount of time saved over the time required for laying out this casting is obvious.

A jig for drilling the one hole in a split valve packing-ring is shown in Fig. 10. The old method of making these rings was to turn them, drill them, and then split them. They had to be laid out for drilling. Now they are turned, split, and then drilled, saving the laying out time. One end of the ring is held firmly by the clamp *A* and the other end is locked into block *B*. The knurled screw *C* passes through a hole in block *B* and screws into a swivel nut attached to the plate to which the clamps are attached. By turning screw *C*, the ends of the ring are brought together and clamp *D* is applied. Then the hole is drilled through the bushing shown just under the point of the drill.

FIG. 8—UNIVERSAL JOINT ON A REAMER

The machine shown in Fig. 11 was built in the shop tool room, and is used for milling the ports in slide-

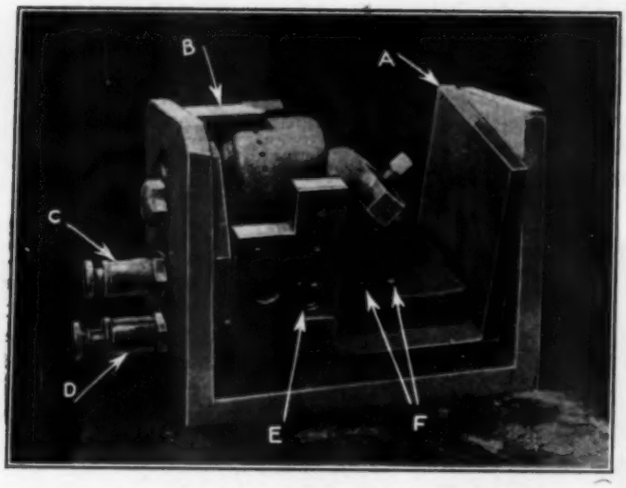


FIG. 9—DRILL JIG FOR JET-NOZZLE

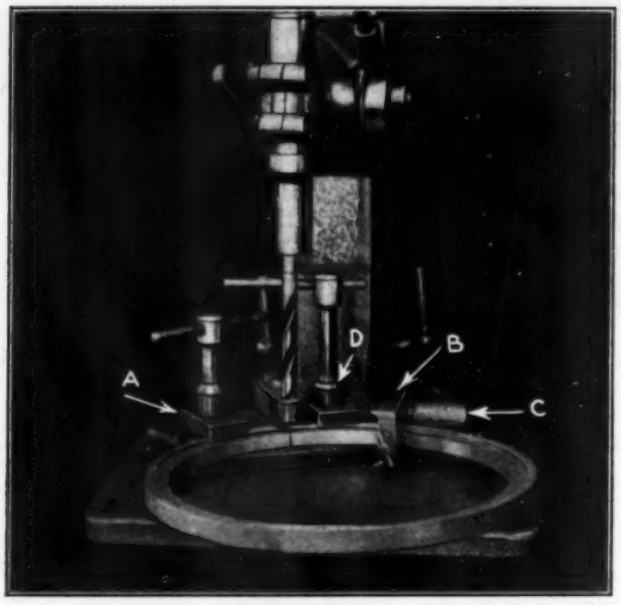


FIG. 10—DRILLING A SPLIT VALVE PACKING-RING

valve cylinders. Little description is necessary as the operation of the machine can be determined by studying the photograph. The cross-rail is bolted to the two angle plates *A*, and to the bottom of each plate is attached a nut in which the screws *B* turn. The handle *C* turns a shaft on which are two bevel gears that mesh with similar gears on the ends of the screws, making it possible to feed the mechanism across the work.

The vertical feed-rod and cross-feed screw operate the same as on any cross-rail. Without this machine, it would be necessary to chip the clearance by hand or air-hammer, then put the cylinder onto a planer and finish the ports, a very tedious operation. This method used to take approximately six hours, while by using the machine shown, the job can be done in two hours, a worth-while saving.

The home-made link-grinding machine shown in Fig. 12 is used for grinding the radius on the inner surfaces of a link. The wheel, shown at *A*, is 2¼ in. in diameter and 3¼ in. long when it is new. The link is held in place by the clamping action of the two bolts *B* through the carriage *C*. The carriage is made of two parallel pieces held together by shafts through either end, these shafts also serving as axles for the four wheels on which the carriage rides. The wheels are V-shaped to fit into the grooves in the ways *D*. The handle *F* is used to

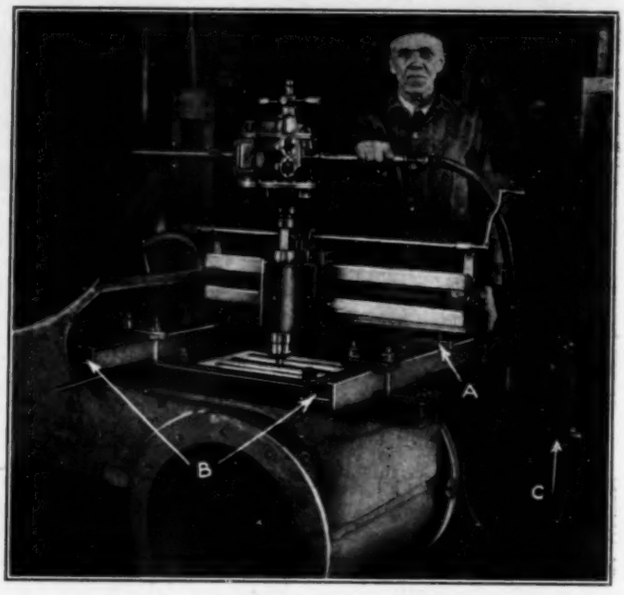


FIG. 11—MILLING PORTS IN SLIDE-VALVE CYLINDERS

feed the carriage past the wheel. The wheel is attached to a slide which can be adjusted for height by turning the handle *G*, attached to an adjusting screw. Although the ways are perfectly straight, the carriage describes an arc as it rides back and forth on the ways, the radius of the arc being determined by raising and lowering the ways by means of the screws *E*. The ways are attached to a large plate *H* that can be adjusted so that the wheel will be worn evenly.

The link shown in the photograph is of the hand-

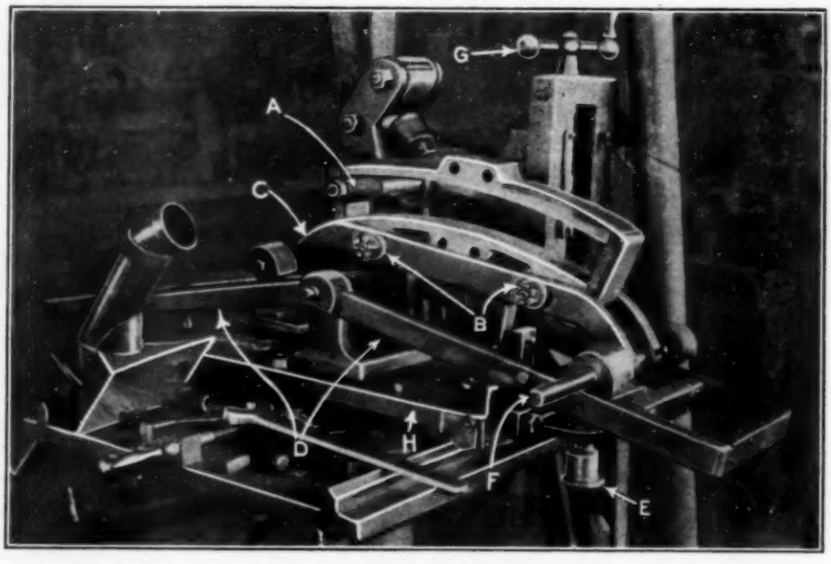


FIG. 12—"HOME-MADE" LINK GRINDING MACHINE

forged type which has been discarded for those of cast steel. Spring steel plates ⅜ in. thick, made from old locomotive springs, are welded onto the radial surface of the cast steel links, and are then ground to the desired radius. When these plates are worn down to the limit, they are replaced. Thus the links are saved, the scrap spring-leaves are made use of, and the time of electric-welding a pair of spring-plates into a link is small compared with the time required for forging a new link.

The mechanism shown in Fig. 13 is a device for pressing cylinder bushings into place, and is counted one of the most valuable labor-saving tools in the shop. It consists of an ordinary air drill, the spindle of which drives a set of compound gearing enclosed in the housing *A*. The hub of the fourth, or driving gear, contains a nut that is threaded to fit a square thread on the screw B. This screw is 2¾ in. in diameter and extends through the cylinder, and through a brace and nut on the other end. A ball-bearing thrust washer is placed between the nut which does the pulling and the hub of the plate *C*, to take the wear and facilitates the operation. When the air is applied, the gears turn and the nut threads itself onto the screw, driving plate *C* before it and pressing the bushing *D* into the cylinder.

The older and more usual method of doing this job is to heat the cylinder until it expands until the bushing can be pressed or driven in by hand. This, however,

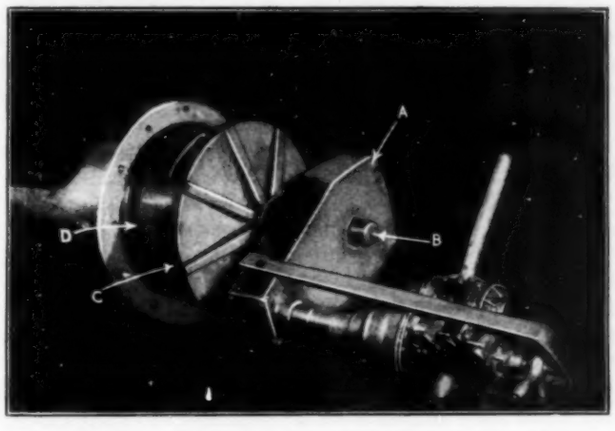


FIG. 13—PRESSING-IN A CYLINDER BUSHING

is very hard work and the time required for the heating alone is approximately three hours, whereas, with the devices shown here the job can be done in 45 minutes. Heating the cylinder also sets up stresses in the metal which sometimes prove disastrous. The strength of the mechanism is evident from the fact that it has pulled 150 tons in a test.

Time is also saved by the method of fitting the bushing to the cylinder. Instead of boring the cylinder straight, the left, or last half is bored ⅛ in. smaller than the right, or first half and the bushing is turned to fit it accordingly, leaving the usual amount on each diameter for a press fit. This makes it possible to insert the bushing half-way into the cylinder before power has to be applied, yet the bushing fits just as tightly as though it were all one diameter.

The operation of milling the ports in a valve bushing is shown in Fig. 14, using a Milwaukee No. 3 milling machine and a rotary attachment that is supplied by the manufacturer of the machine. The table of the machine is adjusted so that the cutter is central with the rotary table, then the feed mechanism is applied,

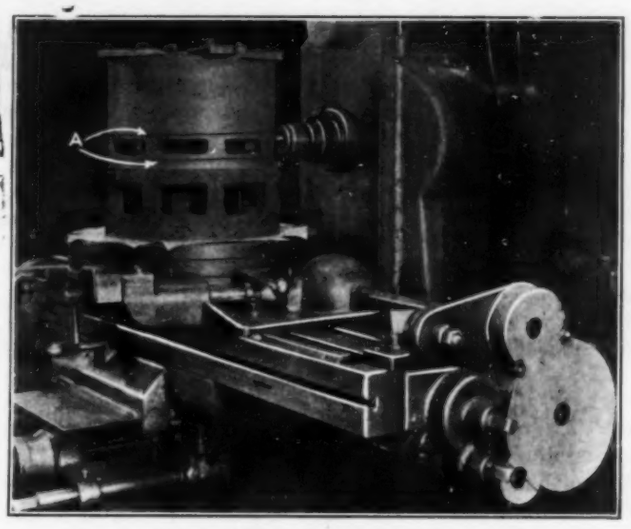


FIG. 14—MILLING PORTS IN A VALVE BUSHING

through a train of gears, to a worm and wheel on the under side of the rotary table. The two lines *A* are the operator's layout lines. After laying out the casting, the table is fed in until the cutter is through the wall of the casting, then the rotary feed is applied. The top edges of all the holes are milled first, then the bottoms. A gage is used by the operator to be sure that every port is of the correct size and shape.

Grinding and Other Practices in Motor Building

By Frank C. Hudson

There is a general tendency toward making motors and other parts of motor cars so they will be longer lived. Bearings are being better fitted, with due allowance for the oil film for lubrication, and piston pins are being carefully considered. The use of aluminum alloy pistons introduced a new problem in the way of increased expansion in the piston itself as the motor warms up. Where the piston pin is held in the connecting rod it is necessary to have the pin fit the piston very closely, when cold. One builder heats his pistons in hot water before putting the pins in place, thus expanding the pistons so the pins will slip in more easily.

Long service between repairs demands that both the holes and the pins be round, which also applies to the bushings used in some connecting rods when they do not carry the pins. In most cases the holes in pistons are finished by reaming, although some are ground and a few makers have tried broaching. Piston pins are ground without an exception so far as we know, but the grinding practice differs materially from shop to shop.

Piston pins are made in two ways, from steel tubing and from bar stock, and in the latter case the drilling is usually divided into two or three operations. There seems to be a feeling that the steel runs more uniformly in bars than in tubing, and that pins of more uniform hardness can be secured if made from a bar. The holes are usually countersunk to fit a 60-degree center for grinding between centers. In all cases the ends of the pins are either chamfered or the corners rounded. In a few cases the holes in the pins are rough ground, but this is unusual. The general practice is to grind the countersinks to insure a perfect seat for the centers in

grinding the outside, though where the pins are ground on the centerless type of machine, this is unnecessary.

Ever since the centerless grinding machine came into use there have been many questions as to its ability to grind pins round and straight. Time and experience have proved that both are possible on a good machine, properly handled. But here again practice varies widely. Some makers advocate the centerless machine for rough grinding, leaving the finishing to be done between centers. Others, and among them some who are very exacting as to requirements, reverse this process and rough grind between centers, finishing on a centerless machine.

Moreover, they get a splendid job, both as to roundness, straightness and finish, and at a rate of from 12 to 15 a minute. This production could be increased except for the fact that the pins are not allowed to fall into a chute or box but each one is picked out to be sure it is not marred in any way. By this method, with the 0.02 in. left for the finish grind, they secure a beautiful surface which does not require lapping and pins which test round on a Prestwich or other supersensitive gage.

Experience indicates that the centerless grinding machine will produce round work if the pins are round to begin with, while there are some who contend it will perfect pins that are not round. Steering pins, bushings, rollers and the like are being ground in large quantities on centerless machines, the continuous process evidently appealing to production managers. In some cases parts are being redesigned so that they can be finished on the centerless machines. For, while parts with collars can be ground without centers, the advantage of continuous feeding is lost and in many cases it has been found advantageous to omit collars and other protuberances.

The finishing of bushings for the small ends of connecting rods where the piston pins either float or are held in the pistons, is another operation that is performed in various ways. Some bushings are broached, some bored with a single point tool (a diamond in a few instances), some ground and many reamed. The final finishing takes place after the bushings have been pressed into the rods. One builder grinds the bushings after they have been put in place, swinging the connecting rods on a face plate which locates them by the large end. This method insures the holes being at the correct center distance and in alignment with each other. But the hole is not ground to size, as the surface left by the wheel is not just what this particular maker desires. So 0.002 in. is left for finish by reaming. It is contended by some makers that while the ground surface may not appear to be as smooth because of its lack of polish, that in reality it provides a good bearing surface. And further, that if there are any indentations due to the grinding wheel, they are extremely small and serve only as tiny oil pockets.

The bearings at the large ends of connecting rods and the main or line bearings in the crankcase are a different story. Here as with piston pins, there seems to be a leaning toward selective assembly with regard to the high and low limits. The bearings are either selected to give the proper fit on the crankshaft or else they are reamed to fit the shaft by Martell or some similar system. Scraping has been abandoned by nearly all motor builders, as the general opinion seems to be that a reamed bearing is best when properly done.

The "burning-in" of bearings is practiced in a few large production plants and when well done is very satisfactory. The bearings are pinched tight on the shafts and the shafts run until the bearing metal softens enough to conform to them in every particular. The "running-in" of bearings is an entirely different matter and should not be confused with burning-in. Running-in is in reality nothing but a limbering up of the bearings to insure enough space between them and the pins or shafts, for a sufficient supply of lubricant. The methods used vary from running the engine by an electric motor with rods in place and thoroughly lubricated —to running the rods in on a dummy shaft which represents the crank pins. The objection to the latter method seems to be that the crankpin is assumed to be exactly the same size as the dummy shaft, which can hardly be the case. Some builders give every motor a running test under its own power for a given length of time and a few go so far as to tear the motors down and, after careful examination, reassemble them for a short final test and assembly in the chassis.

Report on Gage Steel

The Gage Steel Committee of the Bureau of Standards report that satisfactory progress has been made in the study of the wear of "Ketos" steel. This steel, as hardened, has been worn against itself and against hardened disks tempered at 150, 200, 250, 300 and 400 deg. C. (302, 392, 482, 572 and 752 deg. F.). The results obtained to date indicate that, under the very special conditions of testing used, the steel is increasingly resistant to wear with increasing tempering temperatures up to about 300 deg. C. (572 deg. F.). With higher tempering temperatures the wear resistance decreases. Tests of this steel hardened and tempered at several other temperatures are now in progress.

A few preliminary experiments on a steel which has no hardening transformation in the heat treating range, showed that a scale several thousandths of an inch thick forms on heating to 800 deg. C. (1,472 deg. F.) in an electric furnace with access of air. To obviate oxidation, 4-in. cylinders of this steel were heated in an electric furnace in which illuminating gas was burning and quenched in water. One, previously silver plated, was free from scale and showed a shrinkage of about 0.0001 in. in length and diameter. The other, unprotected, increased 0.0002 in. in length and 0.0003 in. in diameter and a thin scale formed. The difference between the two is evidently the thickness of the scale formed probably on transference from furnace to bath. Assuming that the difference between the change in diameter at the center and at the end is a measure of distortion, there is no indication of distortion on water quenching. Appreciable distortion must then occur with the hardening transformation.

High carbon steels having a hardening transformation during quenching, flake off their scale and this leaves the surface clean. To estimate the thickness of the surface layer so lost, a specimen of 1.10 per cent carbon steel was oxidized in an electric furnace with free access of air and found to lose 0.057 grams (0.88 grains) on removal of the scale. This is equivalent to a surface layer of iron about 0.0002 in. thick. It seems probable, therefore, that if precautions are taken to prevent oxidation in the furnace, scaling will not lead to serious error. Experiments are now under way to study the distortion accompanying the hardening transformation in chrome steel, taking the obvious precautions noted above.

Infection from Cutting Oil

Used Screw Machine Oil a First-Class Germicide—Results of a Careful Laboratory Test on Cutting Oils—Soda Solution a Remedy

By A. L. De LEEUW
Consulting Editor, *American Machinist*

AN ARTICLE in the *American Machinist* of September 21st, 1922 by Gus Haessler tells of the benefits derived from the sterilization of cutting oil. The article winds up with the following sentence: "Sterilization attacks the problem at its root and oil systems that do not include this process should be regarded as hardly in step with modern sanitary engineering practice." The following remarks are not for the purpose of minimizing the value of sterilization but of putting before the users of cutting oil, which means before the management of practically all machine shops, the facts obtained by an investigation of the troubles resulting from the use of such oils.

At one time, the Singer Manufacturing Company was confronted with these troubles. Many men in the screw machine department and in other departments, where cutting oil was used, suffered from infection which sometimes resulted in sores on the arms or other parts of the body, in some cases causing nausea and other internal troubles and occasionally both. The writer among others was firmly convinced that sterilization was necessary and that it would probably solve the problem. In order to find out how to proceed with the greatest possible amount of assurance, the Lederle Laboratories were asked to make tests of oil, new and used, with and without sterilization and to suggest means of obtaining the best possible results. Three reports were received from the laboratories and one is printed here in full, with the kind permission of the Singer Manufacturing Company.

LEDERLE LABORATORIES
SANITARY, CHEMICAL AND BACTERIOLOGICAL INVESTIGATIONS

39-41 West 38th Street
New York City

SECOND
REPORT

In the Matter of a Series of Bactericidal Tests of Two Samples of Lubricating oil marked "Lard Cutting Oil as Received, 1" and "Lard Cutting Oil after Use, but not filtered, 2." Received from the Singer Manufacturing Company, about April 19, 1916.

TECHNIQUE

Test organism: In all of the tests here reported Staphylococcus pyogenes aureus, grown in beef extract broth for 24 hours at a temperature of 37 deg. C., was the organism against which the germicidal efficiency of the oil was tested.

Environmental factors: Before the beginning of the test the portions of oil which were to be tested were raised in temperature to 37 deg. C., by the expedient of placing them in a body heat incubator for a sufficient length of time.

The operation which marked the beginning of each test consisted in removing the oil from the incubator and inoculating each portion with two-tenths of a cubic centimeter of the 24 hour, 37 deg. C., broth culture of Staphylococcus aureus, which had been filtered to remove clumps; and immediately returning the portions of oil to the incubator. In this manner the temperature environment was maintained and the efficiency of the tested materials measured at a given point.

The amount of each tested portion was twenty cubic centimeters, contained in a one-ounce, glass stoppered bottle which had been sterilized prior to use.

In each of the first five tests the two controls which were included consisted of sterile distilled water and, in one of these, 0.5 per cent sodium chloride had been added before sterilization. In each case, the amount was twenty cubic centimeters.

Procedure Followed in Making the Various Tests

In test No. 1 the oils were tested without in any way altering them.

In test No. 2 the oils were tested after heating, at 100 deg. C., in flowing steam, one time for thirty minutes. This was done by transferring 50 c.c. or more from each of the samples to a small flask and sterilizing it in that container.

In test No. 3 the oils were heated at 100 deg. C., in flowing steam, two times for thirty minutes each time, before testing.

In test No. 4 the oils were heated at 100 deg. C., in flowing steam, three times for thirty minutes each time, before testing.

In test No. 5 the oils which had been heated at 100 deg. C., in flowing steam once only, were again heated in superheated steam under a pressure of 20 lb. for twenty minutes before testing.

In test No. 6, oil No. 2 was omitted. Oil No. 1 was treated in two different manners to make it germicidal, and was used, untreated, as a control. The treatment of one portion consisted in heating it, in a porcelain casserole, over a free flame for 10 minutes. The treatment of the other portion consisted in adding to it Merck's Xylenol, B. P. 200 deg.—215 deg. C., in the proportion of 1:1000.

In test No. 7 No. 1 oil was heated in a sand bath over a free flame for one hour and forty-five minutes, thereby charring and reducing it in volume to a noticeable extent. Number 1 oil, untreated, was used as a control.

Oil number 2 is a sample of the used but unfiltered oil. The results above reported show it to possess rather marked germicidal properties (Test No. 1) which were not in any way reduced by the subsequent heatings (Tests Nos. 2 to 5 inclusive). In view of the fact that the used oil becomes heated during use, attempts were made to determine whether heating of the fresh new oil would also bestow upon it germicidal powers. Apparently heating does produce such a change, but the amount of heat is upwards of 125 deg. Centigrade. As yet no efforts have been made to

determine definitely the point at which this property is produced, it being the present object to indicate in a qualitative manner that the heating was capable of developing the germicidal property in the oil.

The germicidal property in the used oil, No. 2, is far superior to that produced by the addition to new oil No. 1, of one part to one thousand of Xylenol, although the latter has ten times the germicidal strength of phenol when tested in appropriately constructed emulsions.

It would appear that the course to be pursued in the prevention of the transmission of disease producing bacteria from worker to worker by the new oil, would be to thoroughly mix the new oil which is customarily added to the used oil, and to do so before filtering and heating rather than afterwards. In this way the new oil would be subjected to both the germicidal action of the used oil and to the heating process, which later may tend to produce germicidal qualities in the new product.

These results would tend to indicate that the skin disease among some of the workers was not due directly to the transmission of infectious bacteria by the oil. A plausible working hypothesis is that the change made in some constituent of the oil by heating develops not only some germicidal property in it, but also some skin irritating substance or quality. It is altogether possible that this newly developed substance or property is also the cause of the symptoms of weakness and nausea of which some of the workers complain.

Respectfully submitted,

H. D. PEASE

Director, Dept. of Bacteriology Lederle Laboratories

F. D. BELL

Secretary

To: THE SINGER MANUFACTURING CO.
Elizabethport, New Jersey

This report shows not only that used oil has no more bacteria than new oil but that it doesn't have any at all and also that the used oil is so strong and effective a germicide that it is recommended to mix the new oil with some of the old if danger of infection is feared. The results were so completely at variance with what the writer had expected that nothing but a detailed scientific report would have convinced him and he can well understand that many others will require such positive proof before they can be convinced. It is for this reason that the report is printed in full.

REMEDIAL EFFECT OF SODA SOLUTION

This report was turned over to the shop physician who based his future action on a fact which had not been noticed heretofore but which was now observed, namely that the men who washed the screw machine products in the soda kettle never had sores on the forearms which were bare or on any other part of the body which was occasionally spattered with the soda solution but that their skin would be affected on those parts which were covered and where the clothing might be partly saturated with oil.

As a result of this observation, the doctor advised the men to wash themselves several times a day in a fairly strong soda solution. In addition he gave them some internal medicine and this treatment overcame the difficulty completely. It is to be regretted that the shop physician did not try the two treatments separately in order to find out which was the really efficient one. The fact, however, that the washers were free from trouble on those parts of the body which came in contact with the soda solution would prove to the writer that it is the soda solution which is the effective remedy. Whether the trouble comes from the free fatty acids or from the very fine chips which may get in the pores of the skin or perhaps from some aldehyde which is formed in the oil is not known.

The foregoing is not an argument against sterilization of oil though the report shows that sterilizing at 100 deg. C. (212 deg. F.) is not sufficient and that sterilization does not take place until a temperature of 125 deg. C. (257 deg. F.) is used. It does point out, however, that sterilization does not eliminate bacteria, because there are none to eliminate. If oil is sterilized at all, it should be sterilized when new. It was also found at the plant of the Singer Manufacturing Co., that sterilization alone did not remove the trouble, but that washing in alkaline solutions did.

LABORATORY TESTS ON CUTTING OILS

TEST NO. 1

Oils not treated in any manner, but inoculated with Staphylococcus aureus

Materials tested	Number of organisms surviving after indicated intervals of exposure: 6 hours	24 hours
Oil No. 1	36,000	1,200,000
Oil No. 2	0	0
Aq. dest. + 0.5% NaCl	2,630,000	770,000
Aq. dest.	2,720,000	660,000

TEST NO. 2

Oils sterilized at 100 deg. C., 1 x 30 minutes and inoculated with Staphylococcus aureus

Oil No. 1	4,385,00	2,070,000
Oil No. 2	0	0
Aq. dest. + 0.5% NaCl	2,670,000	1,315,000
Aq. dest.	2,735,000	270,000

TEST NO. 3

Oils sterilized at 100 deg. C., 2 x 30 minutes and inoculated with Staphylococcus aureus

Oil No. 1	2,110,000	0
Oil No. 2	0	0
Aq. dest. + 0.5% NaCl	990,000	950,000
Aq. dest.	1,145,000	100,000

TEST NO. 4

Oils sterilized at 100 deg. C., 3 x 30 minutes and inoculated with Staphylococcus aureus

Oil No. 1	3,955,000	1,865
Oil No. 2	0	0
Aq. dest. + 0.5% NaCl	10,000,000	6,315,000
Aq. dest.	8,000,000	26,500

TEST NO. 5

Oils sterilized at 100 deg. C., 1 x 30 minutes + autoclaving at 20 lb., 20 minutes, and inoculated with Staphylococcus aureus

Oil No. 1	700,000	20
Oil No. 2	0	0
Aq. dest. + 0.5% NaCl	6,400,000	4,080,000
Aq. dest.	6,200,000	3,825,000

TEST NO. 6

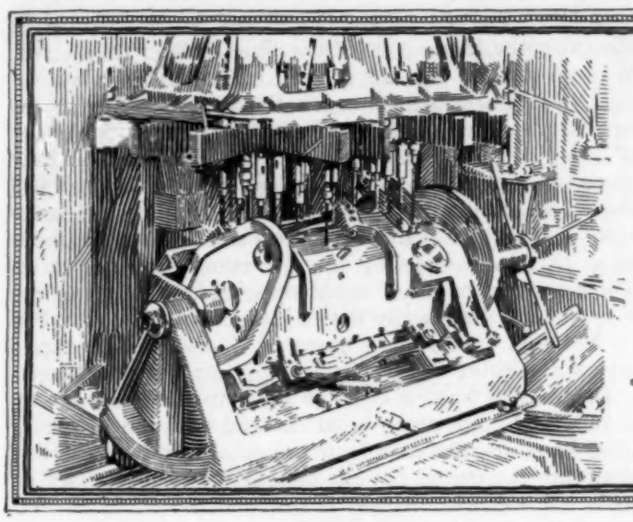
Oil No. 1 heated over free flame 10 minutes
Oil No. 1 with Xylenol added in proportion of 1:1,000
Oil No. 1 untreated, and all inoculated with Staphylococcus aureus.

Oil No. 1 heated over flame	1,890	0
Oil No. 1 with Xylenol	3,315,000	590,000
Oil No. 1 untreated	3,300,000	1,770,000

TEST NO. 7

Oil No. 1, heated in sand bath 1 hour, 45 minutes
Oil No. 1, untreated, and both inoculated with Staphylococcus aureus.

Oil No. 1 heated in sand bath over free flame	0	0
Oil No. 1 untreated	6,000,000	1,295,000



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Bending Dies for Producing Circular Work—Methods of Forming Bushings—Curling Beaded Work and Similar Parts—Plain and Progressive Bending Operations

WHEN a piece of work is to be formed in a circle there are many ways in which the operation can be done. It requires more than one operation to complete a circular piece, although it is possible to combine operations in such a way that one part will be produced at each stroke of the press. A very ingenious die has been recently designed for producing bushings. The development is interesting and somewhat different from the average run of die practice. The work shown at *A* in Fig. 478 is a bronze bushing which was previously made from a casting. The operations required in the old method were turning the outside diameter, facing the ends and reaming the hole, allowing sufficient stock for line reaming after assembling. A chamfer such as shown at *B* was also machined, so that the bushing would enter the work easily.

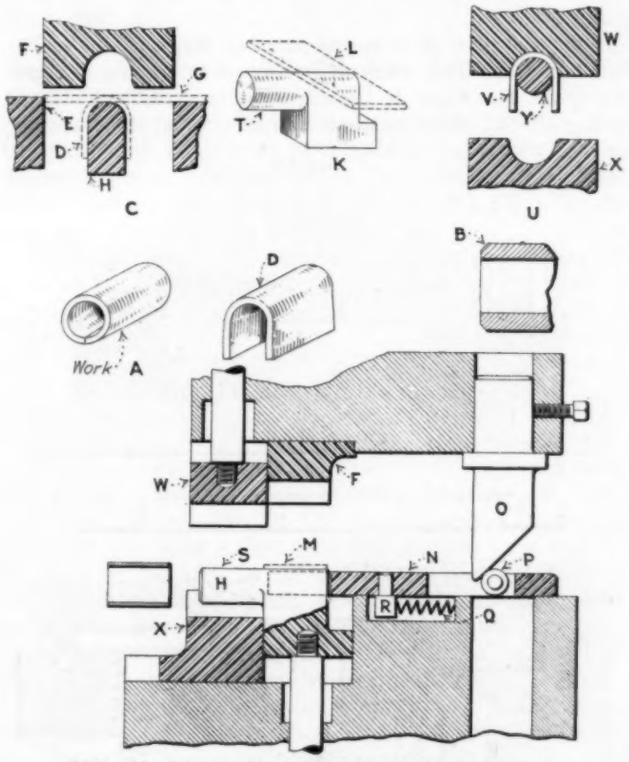


FIG. 478—DIE USED FOR FORMING BUSHING

As a large production of these bushings was required, the die shown was designed to meet the requirements, and it was found that the bushings obtained were within the required accuracy. The bushings were made from strip stock, and before running through the die they were put through a shearing operation which cuts the bevel or chamfer *B*. The die shown cuts the blank to suitable length and does two forming operations at the same time.

The first operation, shown at *C*, bends the work in the form *D*. The stock stops against the portion *E*, and as the punch *F* descends the material is cut off to length at *G*. As the punch continues its downward movement it forms the work over the support *H*. A detail view of this part is shown at *K*, and a piece of work is shown in dotted lines at *L* before it is bent into U-shape. In the sectional view of this die the work is shown at *M* by dotted lines.

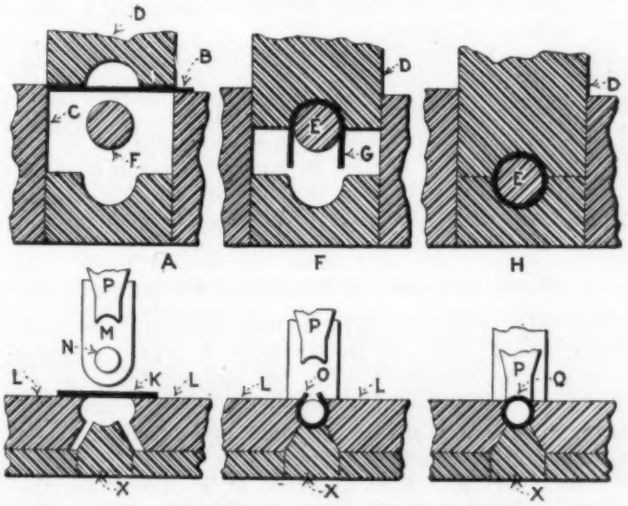


FIG. 479—DIES FOR FORMING BUSHINGS

After the work has been cut off and bent to its first shape, the punch descends and the work is pushed for-

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ward by means of a fork-shaped sliding plate *N* operated by the tapered pin *O*, which strikes against the roller *P* set in the plate. A spring *Q* thrusts against the pin *R* on this plate and forces it forward when the punch is withdrawn. As this operation is completed, the fork moves the U-shaped piece of work forward until it lies over the plug end of the support *H*, as at *S*.

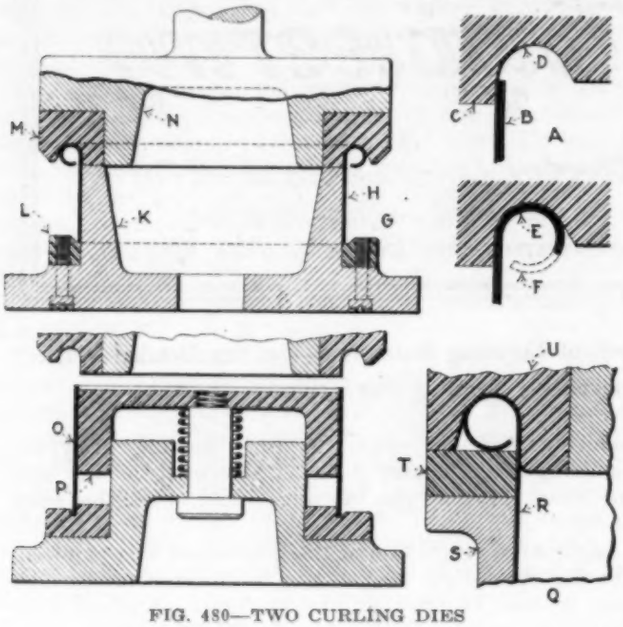


FIG. 480—TWO CURLING DIES

The view at *K* shows more clearly how this piece is moved forward over the plug section *T*.

The second forming operation is shown in the cross-sectional view at *U*. Here the work is indicated at *V*, and as the punch *W* is brought down it strikes the work and holds it on the arbor *Y*. As the action is carried further the work enters the die *X*, to which it is forced to conform, thus completing the circle. The punch ascends after this operation, and at this stage the plate *N* forces a previously semi-formed bushing forward, which pushes off the completed bushing. This operation is repeated so that at every stroke of the press a complete bushing is made.

By using this die with a friction feeding device, the trip of the press can be permanently set so that 90 to 100 bushings per minute can be produced. A bushing of this type is often made with a small oil hole in the center, and if this is desired it is possible to put a punch in the die *F* and a hole in the support *H*. The die is so designed that the parts are interchangeable and various sizes of bushings can be produced.

Other Methods of Producing Bushings

Two other methods of producing bushing forms are shown in Fig. 479. In the example *A*, which employs a curling die, the stock *B* is fed against the edge of the die at *C* to determine the length. The punch *D* is arranged so that it shears the blank and carries it down over the pin *E*, which is supported in a slide by means of heavy springs. The diagram at *F* illustrates the position taken by the blank *G* over the pin *E*. A continuation of the movement downward causes the edges of the blank to enter the lower die and follow it around, thus producing the completed bushing as shown in diagram at *H*. When the punch recedes, the pin follows it upward and leaves the bushing exposed so that it can be removed by sliding over the end of the pin.

Another method of producing the same bushing is shown in the lower part of the illustration. The blank *K* is located on the die *L* and the punch *M* carries a pin *N*, which comes down on the blank and forces it against the anvil *X* and between the movable members of the die. A continuation of the movement causes these two movable members to close in on the work until they have formed it to the shape shown at *O*. Immediately after this the punch *P* strikes and finishes the form as at *Q*, thus completing the operation. The punch *M* which carries the pin *N* is obviously mounted on springs of sufficient stiffness to develop the necessary pressure in forming. These two examples illustrate the application of closing-in attachments to forming operations.

Dies which form a circular bead around the edge of round work and which bend the end of work in a circular bead are also called curling dies. Examples which illustrate the use of curling dies are butt-hinges, water pails, funnels, automobile horns, cooking utensils, etc. All of these parts have a curled portion which is made by a curling die, and although they may be entirely different, the principle used is the same in each case. Fig. 480 shows two examples of curling dies and illustrates the principles employed in work of this kind. At *A* is shown the work *B* which is to be curled in the die *C*. This die supports the back of the work, and as it is brought down the work curls around the formed edge *D* and produces the shape shown at *E*. The amount of curl obtained is governed by the stroke of the press. In most cases the curl is made as shown by the dotted lines at *F*.

A die for curling a round tube of large diameter is shown at *G*. The work *H* is set over a ring *K* and locates on the plate *L*. The punch is provided with a curling die *M* which is located in a body *N*. The operation of this die consists of bringing the punch down on the work until sufficient curl has been produced. In this case the curling die *M* stops against the ring *K*.

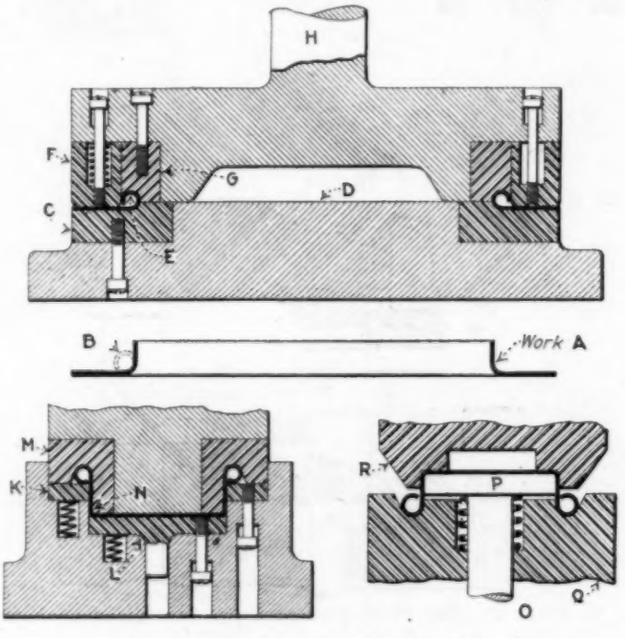


FIG. 481—TYPES OF CURLING DIES

The lower illustration is for a similar operation, although the die is of somewhat different construction. When the punch is in its upper position the work *O* is slipped over the ring *P*, which is mounted on a spring

slide and has an action similar to that of a stripper. The function of this ring is to prevent the stock from buckling when the die is brought down. The work is curled in the same manner as shown above and the construction of the die is somewhat similar.

It is sometimes found necessary to locate work in a bushing rather than on a plug, and at *Q* is shown a diagram to illustrate this method. The work *R* is located in the ring *S*, and the latter is provided with a hardened steel ring *T*. As the curling die *U* comes down on the blank, the work curls in the position shown and strikes against the ring *T* which determines the proper shape.

Examples of Curling Operations

Some other examples of curling operations are shown in Fig. 481. At *A* is shown a piece of work which is to be curled as indicated at *B*. The die used for this operation is shown directly above it. The locating ring *C* is fastened to a cast-iron shoe *D*, and the work locates on a previously formed radius *E* on this ring. The punch is provided with a pressure ring *F*, so that as it is brought down it pinches the work between it and the ring *C*. Then as the punch continues downward the curling die *G*, which is shaped to the required form, curls the work as shown. The pressure ring *F* assists in curling the work as the punch moves to its extreme downward position. The curling die *G* is fastened to the cast-iron punch by means of screws, and the punch is held in the press by means of the shank *H*, in the usual manner.

There are times when work of considerable height requires a curling operation, and in cases of this kind a special press having a long stroke is required. A press of this style is not always available, however, and the work can be located in a sliding die which can be drawn from under the punch for removal purposes. After another piece has been put in, the die is again slid back ready for the next operation.

There are cases where a tube requires curling at both ends, and the die for an operation of this kind is constructed along the same principles as those shown, with the exception that the locating ring at the bottom is made to the form of the curl required and the work is free to float while the curling dies are coming in contact with each other, thus curling both ends.

Sometimes it is necessary to curl a piece of work inside rather than out, as shown in these examples. An operation of this kind can be performed successfully in the same manner, although the stock being curled is forced into a smaller diameter and is therefore likely to wrinkle when it is compressed. If a curl of this nature is to be performed on heavy metal it is often necessary to heat is before the operation in order to insure an accurately formed job.

The lower part of the same illustration shows a cover which is to be curled. In this die the work locates in a pressure ring *K* and rests on a pressure pad *L*. The punch or curling die *M* is provided with a pilot *N*, which locates on the inside of the work and prevents it from buckling. As the curling die is forced down the work is curled, and at the end of the stroke the ring *K* and pad *L* strike bottom as shown in the illustration.

Curling Operation With Work Inverted

At *O* is shown a die for the same piece of work, although the construction is much more simple than the examples just shown. In this case the work is reversed and put in the die in the opposite direction. The work locates on a pressure pad *P* which is suspended above the curling die *Q* a suitable distance so that it will seat properly. The punch *R* on its downward stroke fits over the work, and as it continues downward the curling operation is completed.

In the construction of curling dies it should always be remembered that there is considerable wear on the dies where the metal slides around in curling, due to the friction of the stock around the form, and therefore dies of this kind should be made of tool steel and carefully hardened. The curling surface should be lapped to insure a smooth sliding movement of the stock passing over it during the operation of forming.

The Dealer's Problems

By J. Bainter

The same merchandising methods that were employed during the war for selling supplies to machine shops certainly have no place in the present order of things. Although everyone knows this and dealers have had to revise their methods in more than one particular since the war, some good might result from reviewing the dealer's problems. The fact that the dealers have already survived what is probably the hardest part of the trial is, of course, some encouragement for the future.

The trouble with the present market is that the margin left to the dealer is too small to enable him to continue his business as he formerly operated it. His salvation lies in reducing the overhead expense connected with selling. The outstanding features in such a program are the necessity for a higher turnover and a decrease in the inventory.

Standardization and simplification of lines are the biggest helps that can be given to the dealer. This work can be carried on, of course, by manufacturers within their own organizations so as to decrease the number of their products, although it is especially desirable that types and sizes of equipment be standardized throughout the whole branch of an industry by means of trade associations. Great cuts in inventory have been obtained by progressive dealers through standardization. By stocking only the popular lines and those that have a quick turnover, it is usually aimed to bring a turnover as high as four complete cycles per year. True, this goal is not frequently reached.

All the expenses connected with merchandising are very high, but the one that probably deserves the most attention is that of the salesman's wage. The method of compensating salesmen has been undergoing a slow change, and it is to be expected that the near future will bring out very many bonus and profit-sharing plans. Already such plans have shown their value.

If the European plan of charging the customer for services given him could be adopted, the dealer would be on a very much more secure basis. Although we are not advocating a departure from the American plan, there are many points which the customer should keep in mind when ordering from his dealer. If the buyer knows how to save the dealer from unnecessary expense, the saving that the dealer derives from such transactions will in the end reflect to the buyer himself.

Trade Apprenticeship Progress

This report is the result of the combined study and experience of a group of men experienced in training, familiar with the best method in current use, and also conversant with the literature, equipment, and methods of the best organized training departments in industry.

A long step has been taken in training young men for the Printing Trades. While only a beginning, it shows what can be done in any industry that will develop a well organized central educational department under a progressive committee on education and with competent supervision. The State of Wisconsin set a notable example by adopting trade apprentice laws that encourage both the employers and the apprentices to take advantage of a well-organized system under state supervision. So far as can be ascertained, this is the only state attempting to train skilled mechanics with the aid of an apprenticeship law.

Equal distribution of the burden of training can be accomplished only through frequent solicitation by some neutral body,—someone constantly prodding the less spirited into seeing the necessity for apprenticeship. Not only must other employers be sold to the idea, but also the co-operation of the journeymen must be secured, as well as that of prospective apprentices, their parents, and the schools. Standard training courses must be developed so that a graduate apprentice will be capable of holding a journeymen's job in shops other than his own.

Fulfillment of indentures requires outside supervision such as is possible under an apprenticeship law. The fact that the state becomes a party to the indenture impresses the apprentice with the assurance that he is going to receive some attention and that he is expected to live up to his agreement. After a three-month trial period, any contract of apprenticeship may be cancelled when good cause is shown. The actual ages when boys should serve apprenticeship are from 16 to 20 years, or 17 to 21 years, assuming a four year apprenticeship course.

Co-operation Between Industries and Schools

There are two direct methods of co-operation between schools and industry: Teaching in school subjects which will show the value of apprenticeship; and teaching those subjects in continuation schools which will supplement the practical apprentice courses conducted by the industries. School at the shop or place of business is to be preferred to instruction given in school buildings or away from the plant.

The characteristics of an industrial teacher are likely to be decidedly different from those of a teacher in the ordinary school. He, or she, must have the point of view of the industry which can be obtained only by experience in it. Industry can contribute not only material but also men qualified to teach.

If industry is to get the better class of boys, it must go after them. These boys will rarely go to the factory looking for jobs. Because of the age factor, we will expect to find our best material in either the junior or senior high schools, or possibly through some organization like the Y. M. C. A. or Boy Scouts where energetic boys may be found who have had to drop out of school for economic reasons but who have in them the making of good men. If the teacher will visit the shop often, and likewise, if those responsible for the boy in the shop, will visit the school often, they will find a common ground where suggestions looking to the correlation of school and shop work may be worked out to the decided advance of all concerned.

The length of an apprenticeship varies according to the trade, for the more skillful the work and the more branches, the longer the time required to master it. In the industrial and manufacturing fields, mechanical apprenticeship is more subdivided than with the railroads. They have a tool maker's apprenticeship varying in length from two to five years. Machine operators from two to four years, erecting or assembling two years, autogenous welding one to four years. The railroads combine all of these into one trade under the name of machinist apprentices, and the boy is taught each of them in four years.

Work Schedule for Machinist Apprentices

The school work for a machinist apprentice requires 200 drawings, 640 problems, 300 examination questions. The schedule of shop work covers: cold saw, 2 weeks; drill press, 1 month; shaper, 2 months; slotter, 1 month; lathe, 6 months; vertical boring mill, 1 month; horizontal boring mill, 1 month; milling machine, 1 month; planer, 1 month; brassroom machines, 3 months; toolroom machines, 2 months; air pumps, 1 month; cutout cocks, 2 weeks; triple valves, 2 weeks; brake valves and testing air, 2 weeks; firedoors, grate shaker and reverse gears, 2 weeks; boiler mountings, 1 month; cylinder and frames, 1 month; piston valves, 2 weeks; stokers, 2 weeks; cab work, 1 week; driving boxes, 1 week; spring brake and truck gang, 2 weeks; guide and pistons, 1 week; crosshead and piston bench, 1 week; piston valve bench, 1 week; rod bench, 1 week; link bench, 1 month; reverse lever and shaft bench, 1 month; valve gang, 1 month; welding, 2 months; roundhouse, 6 months; wheel gang, 1 month; layout bench, 2 weeks; miscellaneous, 2 months; giving a total of 48 months.

When a young man or woman just out of school fails to make good, in industry, or in business, the fault may frequently be found in industry itself rather than in the schools. The power to analyze should be a very prominent and conscious aim on the part of the schools, and of students as soon as they become mature enough to appreciate it. The complete solution of this problem so far as business and industry are concerned will be found in having some one in charge of new employees whose duty it should be to lead them through what may be called an adaptation period—the fundamental idea of the vestibule school—and to help them to become adjusted to their new work.

Abstract of a committee report presented at the first annual convention of the National Personnel Association, Pittsburgh, Pa., Nov. 8-10, 1922.

Attaching Gears to Pinion Shafts in Black & Decker Drills

In an article on the manufacture of Black & Decker drills in the October 12 issue of the *American Machinist*, the statement was made that "The gear seats on the pinion shafts are knurled to make the gears a tight fit when pressed on," giving the impression that this method was followed in all drills made by the Black & Decker Mfg. Co. This method which was formerly practiced only on the smallest drill—the quarter inch—has now been abandoned.

The gears in all other sizes have always been keyseated and pressed on the shafts over Woodruff keys, a practice now extended to the quarter inch size.

Industrial Cost Accounting for Executives

Fourth Article—A Summary of the Cost Accounts and Journals—Material, Wages and Burden Accounts—Controlling Accounts—Different Kinds of Journals

By PAUL M. ATKINS

IN THE previous article we considered briefly the elements which go to make up the cost of the finished product. Here we are to take a hasty glance at the various accounts and journals by means of which these elements are to be recorded. In later articles the details which are passed so hurriedly here or are not mentioned at all are explained at length. It is easier to understand how they all fit together to make a whole if we first look over the entire system even though the details themselves, at this time, are rather hazy and fail to be clear.

The first cost element which was discussed was material and so it may be appropriate to commence our study of the cost records with those needed for it. Before doing so, however, it will probably be well to give the definitions of two or three words which will be used with considerable frequency and about which all writers are not entirely agreed. Their exact definition is not a matter of any great importance just so long as everyone obtains the same idea from their use.

Three Different Kinds of Materials

From the point of view of cost-accounting there are three different kinds of material around factories: stores, worked material and merchandise. Stores includes all materials which are purchased from outside suppliers as long as they are not changed from the form or condition in which they are received at the plant. Such items as raw stock, rough castings, purchased parts and supplies, when they are bought, not made, all fall under this head.

Worked material is used to indicate all material which has been worked upon in the factory and then sent to the storeroom to be held till needed for other orders. Such things as parts and sub-assemblies, made in some department or departments of a factory to be used on various assembled products are examples. There are not a few parts which might be stores at one time and worked material at another, depending on whether they are bought outside or made inside the factory.

Merchandise is the finished product in saleable condition. It will sometimes occur that parts or sub-assemblies will be sold for repair parts but if they are primarily intended for use in the production of merchandise, they will be treated as worked material and not as merchandise. The reason for the differentiation is primarily a cost-accounting one and is necessitated by the nature of accounts required for recording the several kinds of material. The reason should be clearer after the following paragraphs are read.

Perhaps the most satisfactory way to approach the problem is to investigate first the accounts needed for recording the movement of materials and then to study the journals necessary for preparing the entries for these accounts. In the first place, there should be an account for stores, or more than one if it seems desirable. The stores account should be debited with the value of material purchased and received, and credited when material is withdrawn from the storeroom for use. The balance represents the value of the stores remaining in the storeroom.

There should also be a worked material account, subdivided if necessary, which should be debited with the value of the completed worked material and credited with the value of the worked material withdrawn. The balance gives the value of the worked material remaining in the storeroom.

In addition to this account, in which is recorded the value of the finished, completed worked material, there also will be a worked material in process account in which is entered the value of the worked material while it is in process of being made in the factory. It is one of the most important accounts in the cost system for it provides a figure for an inventory which is otherwise practically unobtainable. Of course, this account should be subdivided if the worked material account is divided, and in the same fashion. It is credited with the value of the completed worked material, the same figure which is debited to the worked material account. It is debited with the cost of the various elements which go to make up the worked material—labor, material, burden, and direct charges.

There should also be two sets of accounts for the merchandise—a merchandise account to be debited with the value of the completed merchandise and credited when the merchandise is sold, and a merchandise in process account which is quite similar in its make-up to the worked material in process account, forming a record of the value of the merchandise being worked on out in the shop. As before, the credit to the merchandise in process account is a debit to the merchandise account. In the same way, both accounts may be subdivided if the nature of the product seems to make it desirable.

Wages and Their Account

So much for the records of material in its various stages. A number of accounts are necessary to provide a record of the different kinds of material and to permit the ascertaining of their value at various stages in the course of their progress through the factory. The records of wages are much simpler and require only one kind of account, the payroll account, though it is not infrequently subdivided for convenience. It is credited with the value of the work done by the employees measured in terms of time or output and debited with the amount paid for labor when it is paid.

It might seem at first glance that since the two amounts are always the same there should never be any balance in the payroll account. If the workers are paid on a weekly basis and the accounting period is taken as a month, it is evident that only occasionally will the two coincide and even when they do, the entries are not made at the same time. Hence it will often happen that wages will have been earned but not yet paid for or payable and so there will be a credit balance called the "accrued payroll" which appears as a

For the author's forthcoming book. All rights reserved.

liability on the balance sheet for it represents what is owed to the workers by the company. All the balances of the material accounts, on the other hand, are debit balances and are entered as assets on the balance sheet.

It is now time to turn our attention to the matter of burden and the records needful for that element. In the first place, it is necessary to provide expense accounts in which may be accumulated the expenses as they occur. Only the principal expense accounts, those for the major subdivisions of the business, will be kept in the general ledger. Administration, selling and manufacturing expense accounts are the only ones which need be mentioned here. In later articles it will be pointed out that it is often convenient to divide the manufacturing expense account in two. The debits to these three expense accounts are the charges for indirect labor, indirect materials, repairs and maintenance, depreciation, insurance, outside charges of various kinds and all other items which are a part of the cost of running the business during the period in question.

Since they are expense accounts, they must be closed at the end of the period. The manufacturing expense account is closed into the manufacturing burden account. The selling expense account is closed into a selling burden account, if the company has planned to ascertain the cost of selling the various units of its product. If there is to be no selling burden account, the balance should be charged directly to the profit and loss account.

If there are two burden accounts, the administration expense account should be debited part to one, part to the other. If there is no selling burden account, it may either be debited wholly to profit and loss or part of it to that account and the rest to the manufacturing burden account. There is not space here to explain how the division is made, but it will be discussed in full in a later article on the "Distribution of Expenses."

The handling of the selling expenses is rather outside the scope of the present series of articles. In general, it is somewhat similar to the treatment of the manufacturing expenses, but, to clear the matter up, let us assume that the easy, though not very satisfactory method of charging them all to the profit and loss account is followed, and turn our attention now to the matter of the manufacturing burden account.

The manufacturing burden account is debited with the expenses which are incurred by the various departments which are engaged directly or indirectly in carrying on production and also the proper share of the expenses of those departments which aid production, in other words, the administration departments. The debits, as have been noted, come from the manufacturing and administration expense accounts. The credits are two, one for the earned burden which has been allocated to the product—worked material and merchandise—and the unearned burden which is the balance which should then normally be charged to the profit and loss account.

There are a few other accounts which should be mentioned at this point in connection with the expense accounts. Certain expenses are paid in advance of the time when the benefit from them is received as in the case of insurance premiums. Hence it is necessary to set up a prepaid insurance, for example, to which the insurance premiums can be charged as they are paid, and which should be credited each month when the charge for the insurance for the month is made, to the appropriate expense account.

In some cases, on the other hand, a benefit is received but is not paid for till after the close of the period involved. Real property taxes are an illustration, for

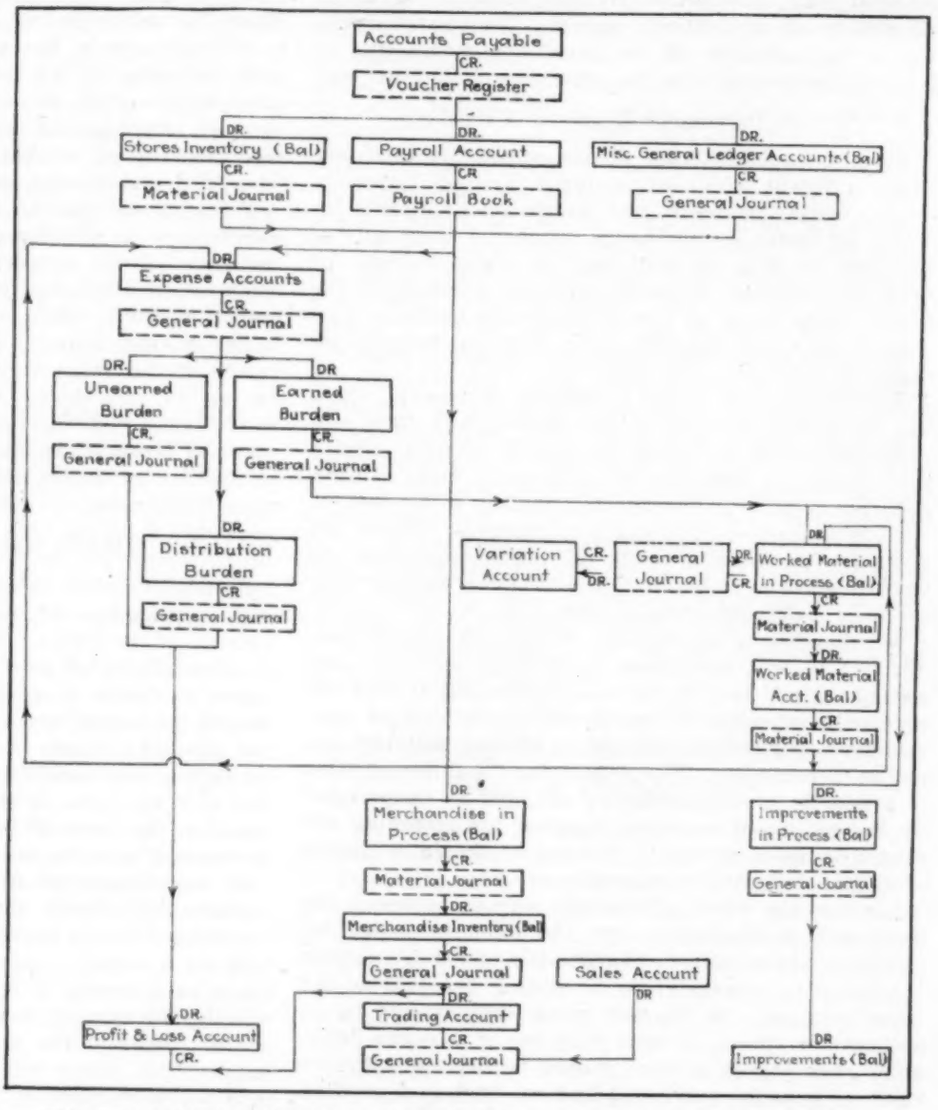


FIG. 2—A CHART SHOWING THE PRINCIPAL COST ACCOUNTS AND JOURNALS

in many instances they are payable and even are not known till the end of the year. It is proper, therefore, to set up a reserve account for taxes in which may be accumulated a reserve to cover the payments when they come due, the corresponding debits having been made to the monthly expense accounts during the year.

Before passing on to a very brief survey of the journals, one other set of ledger accounts deserves a passing mention. These are the various fixed asset accounts like those for machinery, buildings, tools, furniture and fixtures. There should be one of them for each of the principal groups of fixed assets and they should vary according to the classification made of these items. There will sometimes be an "in process" account for each group, but more frequently, except for very large concerns, there will be only one improvements in process account in which will be recorded the value of the various assets while they are in course of construction.

The operation of fixed asset accounts follows, in general, the methods employed for the worked material and merchandise accounts. There is one important distinguishing element, however, that must be mentioned here. All the fixed asset accounts, with the possible exception of tools, should have a corresponding reserve for depreciation account which should be credited monthly with the amount of the depreciation charged as an expense. They show at all times the amount of the depreciation on that class of assets.

It should be noted that many of the accounts mentioned are controlling accounts supported by subsidiary accounts, often not in account form, which exist elsewhere. The stores and worked material accounts are detailed on the balance of stores and worked material cards. The same is true for the merchandise account, if merchandise is made for stock and not shipped as soon as made. The "in process" accounts for worked material, merchandise and improvements are supported by the record of the order costs in the cost department.

The controlling expense accounts are given in detail in the form of individual expense accounts for each subdivision of the expense classification. The fixed asset accounts and the corresponding depreciation reserve accounts are represented in the form of a plant ledger. All of these details and their relationship to the controlling accounts in the general ledger are discussed in subsequent articles.

It is, of course, necessary to prepare the entries for these accounts in some kind of a journal. For some of the entries a regular general journal is most adaptable, and that is a book which should need no explanation. The voucher register is another form of journal which is very useful and which is frequently used, so it needs no description at this place. Certain rulings for the the voucher register are discussed in a later article. The payroll book is also a well known journal.

There are, however, two other journals, and sometimes a third, which are needed and which are not commonly found. One is the material journal which is ordinarily divided into several parts. One part is for the purpose of recording the withdrawal of stores and serves to control their distribution. Another does the same thing for worked material and under some conditions there is a third for merchandise.

There is also a section for handling the value of the worked material completed and turned into the storeroom, and often one also for merchandise. The material journal provides a simple means of handling what is often one of the most difficult practical problems in cost-accounting and is explained in detail in a subsequent article. Similar in purpose and ruling to the material journal is one for burden, to be used when the machine rate or process method of burden application is employed.

This has been a long article and in the effort to compress a great deal into a small space it reads almost like a catalog. There is in it, however, the skeleton of a whole system of cost-accounting and it will repay careful study. Many of the details, as has been pointed out in places, are developed in later articles, for the intention is to make clear all of the points given to the reader before the series is completed.

To aid in grasping the interrelationships of accounts and journals described in this article, the accompanying chart (Fig. 2) has been prepared. The accounts are shown bounded with solid lines and the journals with dotted lines. Too much must not be expected of a chart which tries to show so much so briefly. It will not bear a minute analysis, but it should be used rather to gain a general idea of the whole subject.

Winning the Coal Saving Game

By Charles W. Lee

The game of saving coal is very popular just now, for obvious reasons. There are good ways of playing it and there are some no good at all. Let me illustrate:

Along comes my doctor with a circular intended to promote something out of a bottle or a keg, which it is claimed will achieve the winning of the coal-saving game, and wants to know what I think of it. (Incidentally, I often wonder why my doctor or lawyer, expects, and very properly so, to send me a bill for any advice asked for by me; whereas he would be much surprised if I were to send him a bill for advice asked for by him.)

After carefully reading the circular, I spoke a sort of parable something like this: A "patient"—which is a very good name for him—comes into the doctor's office complaining of not feeling well. The doctor examines him, finds that he has a mild case of something or other, hands him a filled bottle, and says: "Take a spoonful of this every two hours, eat sparingly, particularly of red meats, take plenty of exercise and get plenty of fresh air. Soon you will be O.K." The patient follows instructions and quickly recovers.

There arrives another patient with something the matter, something entirely different from that which ailed the first one. The doctor gives him a bottle of the very same stuff that he gave the first patient, and the same advice about diet and exercise. Patient No. 2 uses the "medicine," follows instructions and speedily recovers.

Now, doc, (I continued) the stuff mentioned in the circular, it seems to me, is comparable with the stuff in the doctor's bottle. The directions in the circular for running the furnace when using the stuff show a mighty good way to run a furnace anyhow and I think if you will carefully follow these directions you will save coal. Moreover, you will save just as much coal, whether you mix the stuff with the coal or don't. Do you see the point? He said he did.

I am not a chemist or a coal expert, but I am a competent operator of a domestic furnace. If there is any truth in what I told the doctor, it goes just the same for the furnace under the boiler as the furnace in the cellar.

Denmark—Exports of Machines for Metal Working or Wood Working with Drilling (Bore) Machines

"Masckiner til Metalforarbejdning Traeforarbejdning samt Boremaskiner"

TABLE IX

Country	1910 Quantity 100 kg	1911 Quantity 100 kg.	1912 Quantity 100 kg.	1913 Quantity 100 kg.	1914 Quantity 100 kg.	1915 Quantity 100 kg.	1916 Quantity 100 kg.	1917 Quantity 100 kg	1918 Quantity 100 kg.	1919 Quantity 100 kg.	1920 Quantity 100 kg.
Germany	400	60	527	322	75	4,338	2,395	3,387	1,005	.....	615
Great Britain	37	36	66	178	18	129	.....	.....	675	735	3,281
Norway	51	44	129	64	73	1,002	4,618	4,739	7,157	6,838	2,532
Sweden	513	.....	60	166	3,449	5,553	11,654	8,380	4,326	3,744	2,138
Finland	25	.....	7	1	8	1,816	456	407	.....	683	387
Russia	525	1,800	673	1,064	1,709	6,387	32,784	12,830	.....	.....	.....
Netherlands	38	217	88	1	3	150	380	1,495	3,088	868	702
Belgium	120	77	.....	44	1	.....	.....	.....	.....	350	3,118
France	159	402	123	68	35	.....	561	.....	.....	1,208	2,785
Italy	83	.....	34	2	.....	.....	.....	.....	.....	115	213
Austria-Hungary	29	26	37	60	166	1,790	.....	.....	128	.....	.....
Switzerland	.....	52	5	.....	68	.....	.....	.....	.....	.....	.....
Bulgaria	.....	.....	42	.....	.....	.....	.....	.....	.....	.....	.....
Portugal	.....	.....	.....	.....	.....	.....	.....	.....	.....	35	310
Spain	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,297
Hamburg	.....	.....	.....	54	35	352	.....	.....	.....	.....	.....
Iceland and Faroe Islands	.....	.....	63	31	2	23	.....	.....	.....	124	137
Morocco	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	46
Algiers and Tunis	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	137
British South Africa	.....	.....	.....	.....	.....	.....	.....	.....	.....	61	237
China	.....	.....	.....	3,387	1,636	174	.....	.....	1,361	360	363
Siam	.....	.....	.....	.....	.....	.....	.....	.....	114	.....	131
Dutch East Indies	.....	.....	.....	.....	.....	.....	.....	.....	.....	48	805
British India	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	439
Straits Settlements	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	46
Australia	.....	12	97	15	47	.....	.....	.....	.....	.....	289
New Zealand	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49
United States	.....	.....	.....	.....	.....	.....	.....	.....	1,152	.....	.....
British North America	.....	.....	.....	40	.....	.....	.....	.....	.....	.....	.....
Argentina	.....	.....	.....	.....	.....	.....	.....	.....	127	855	2,633
Brazil	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	846
Other South American	.....	.....	.....	.....	.....	.....	.....	.....	.....	246	795
Other or Unknown Countries	16	17	15	44	17	90	431	5,746	5,335	126	207
Total (Quantity in 100 kg.)	1,996	2,743	1,966	5,541	7,342	21,804	53,279	36,984	22,721	16,396	24,538
Total Value (Kronen)	400,000	493,000	489,000	951,000	1,255,000	5,127,000	16,401,000	9,831,000	6,566,000	4,687,000	8,547,000

Denmark—Imports of Metal Working Machinery and Drilling Machinery

"Maskiner til Metalforarbejdning and Boremaskiner"

TABLE X

Country or Region	1910 100 kilograms	1911 100 kilograms	1912 100 kilograms	1913 100 kilograms	1914 100 kilograms	1915 100 kilograms	1916 100 kilograms	1917 100 kilograms	1918 100 kilograms	1919 100 kilograms	1920 100 kilograms
Hamburg	137	109	30	79	203	5	.....	.....	.....	.....	.....
Germany	3,798	4,121	5,081	7,461	7,665	2,209	4,223	1,886	2,637	22,295	25,810
Great Britain	236	504	1,244	1,462	847	780	834	.....	.....	206	1,011
Norway	9	184	.....	.....	.....	172	170	606	247	391	124
Sweden	268	470	520	541	1,038	2,711	4,750	2,235	5,362	4,461	1,703
Holland	45	129	57	8	19	122	.....	.....	.....	.....	.....
Switzerland	.....	90	4	9	17	.....	.....	.....	.....	19	14
France	11	.....	.....	.....	.....	.....	.....	.....	.....	46	1
Austria-Hungary	.....	.....	.....	.....	.....	.....	82	.....	.....	.....	.....
United States	217	361	487	550	534	673	1,458	2,509	.....	3,537	2,142
Other or unknown countries	22	11	55	53	37	18	68	34	29	.....	.....
Total Quantity (100 kgs.)	4,743	5,979	7,478	10,163	10,360	6,690	11,585	7,270	8,275	30,955	30,805
Total Value (Kronen)	441,000	467,000	586,000	848,000	868,000	636,000	1,338,000	1,23,8000	1,880,000	4,701,000	5,275,000

Par value of Krone is 26.80c.

Formulas for Cutting and Measuring Threads

Information a Customer Needs for Checking—Practical and Theoretical V-Thread Flats—Distinction Between Helix and Lead Angles—Acme Thread Data

BY JACK WILLIAMS

AN ARTICLE entitled "Gaging Acme Threads Without Special Wires" written by H. A. Pearson, appeared on page 830, Vol. 51 of *American Machinist*. I made a rectigraph copy of this article, which has proved to be of valuable assistance to me in my work. I found, however, upon careful study that only the formulas could be depended on, as there were slight errors which it was necessary to correct in both the text and the constants.

The formula for screws produced the same result as that given for taps. The former read as follows: $4.9937D - 3.8667W +$ outside diameter of screw equals the micrometer reading. The letter D represents the diameter of the wires and the letter W the width of the opening at top of the thread. This formula is open to two serious objections. It is stated in terms of width of opening at the top of the thread when it should have been given in number of threads per inch; its use is limited commercially to threads having a lead angle of six degrees or less.

I have worked out and compiled a set of formulas that should relieve foremen, toolmakers and draftsmen of a great deal of figuring, besides putting an end to a vast amount of correspondence previously required between firms to clear up misunderstandings. The formulas were intended to cover Acme threads, as these threads seemed to be an endless source of trouble, but additional general formulas have also been derived. They are written in a manner easily grasped by the average layman and most of them are in terms of threads per inch, although some of them are also given in terms of pitch to allow the user a choice of mathematical procedure.

My reason for sending in the chart of Acme thread formulas is that I feel that publicity will invite constructive criticism. Possibly someone will either carry the work along and contribute additional data, or compute the maximum error as compared with their own commercial method or with theoretically correct formulas.

The five additional formulas, grouped under IV, which I will explain in detail, are particularly valuable. They may be applied to any symmetrical form of thread, except the square thread, and include the V, U.S.F., Whitworth, Standard International and Acme threads. The formulas for width of flat, however, cannot be applied to rounded or to sharp V threads.

The questions that are asked by shopmen when preparing to make special taps, screws, or gages, are these:

(1) What is the width required at the point of the threading tool?
(2) What is the correct angle of the threading tool?
(3) What is the lead angle to which the tool must be set?
(4) What diameter of wire is to be used in measuring the threads?
(5) What is the micrometer reading over the wires?

The answers to these questions should be enclosed with every shipment of goods so that customers can do their own checking and save the time now wasted in asking for this information, shipping goods back and forth, and arranging credits. If customers would demand it, the manufacturers would be glad to render this service.

At what particular lead angle it is necessary to begin making compensation in the shape of the threading tool is a commercial factor subject to change in accordance with the class of work required. If the lead angle is set at six degrees, and so advertised by the manufacturers, it will soon be grasped by the trade and when customers require especially accurate work they will specify it on their orders. The error in tool angle and consequently in thread angle for a 60-deg. thread of 6 deg. lead angle is 0 deg. 16 min., and for a 29-deg. thread is 0 deg. 10 minutes. A good commercial limit on thread angles is 0 deg. 20 min., so that a 6-deg. lead angle is well chosen and will apply to thread angles of even greater than 60 degrees.

Two main points which strongly emphasize the commercial side of thread measurements are featured in the chart shown in the accompanying illustration. One point, brought out in an exaggerated way, shows the change in angle and the corrected width of the tool point. The other point is the division of the formulas into three groups, one of which applies to all lead angles. The other two apply to lead angles above and below 6 deg. respectively.

Let us use the following symbols to express the answers to the five questions previously mentioned:

(1) f = width at point of the threading tool.
(2) ϕ = one-half the corrected angle of the threading tool.
(3) α = lead angle for setting the threading tool.
(4) D' = diameter of the measuring wires.
(5) R'' = micrometer reading over the wires.

In the process of manufacturing, as soon as the answers to (1), (2) and (4) are known, they should be given to the person who is responsible for the tools. In this way, the tools and the proper size of the wire will be on hand for measuring when the work is ready for threading.

Some firms have found out, after delays and an undersized product have resulted, that it is impossible to manufacture a theoretically sharp V-thread for a given pitch diameter. In other words, the formula: Single depth of V thread = pitch $\times$ cos 30° = pitch $\times$ 0.86603, which was extensively advertised until recently, was not at all practical. For that reason, the formula does not appear in the catalogs of some tool manufacturers. Most of these manufacturers advocate the universal adoption of the U.S.F. thread while others are striving to bring about commercial harmony by persuading their customers to accept the U.S.F. thread on all pitches finer than 30 threads per inch.

Many manufacturers of V-thread tools, such as the

gage makers and those who use pipe threads, are familiar with the following formulas:

N = number of threads per inch P = pitch

Single depth of thread = $0.8 \div N = 0.8P$

Width of flat at top or bottom of thread = $0.03812 \div N = 0.03812P$

Height from flat to theoretical $V = 0.03301 \div N = 0.03301P$.

My reason for explaining the V-thread and its flat is that the same flat should be applied to V-threads of any angle, whether the angle is more or less than 60 deg., and it is not practical to decrease this flat for it is already the smallest flat that can be commercially maintained on a threading tool. Therefore, question (1) does not apply to this form of thread.

The terms "lead," "pitch," "lead angle," and "helix angle" must also be explained. Many engineers and draftsmen are primarily at fault for orders that read: "6 pi. double," "6 P.I. 29 deg. double lead," or "6 P.I. double $\frac{1}{12}$ lead." Such orders merely confuse the purchasing agents and clerks, when they hear the terms "pitch" and P.I. (per inch) interchanged. The pitch is the distance from the center of one thread to the center of the adjacent thread. The lead is the distance from the center of one thread to the center of the *same* thread, after it has made one revolution, measured parallel to the axis of the screw.

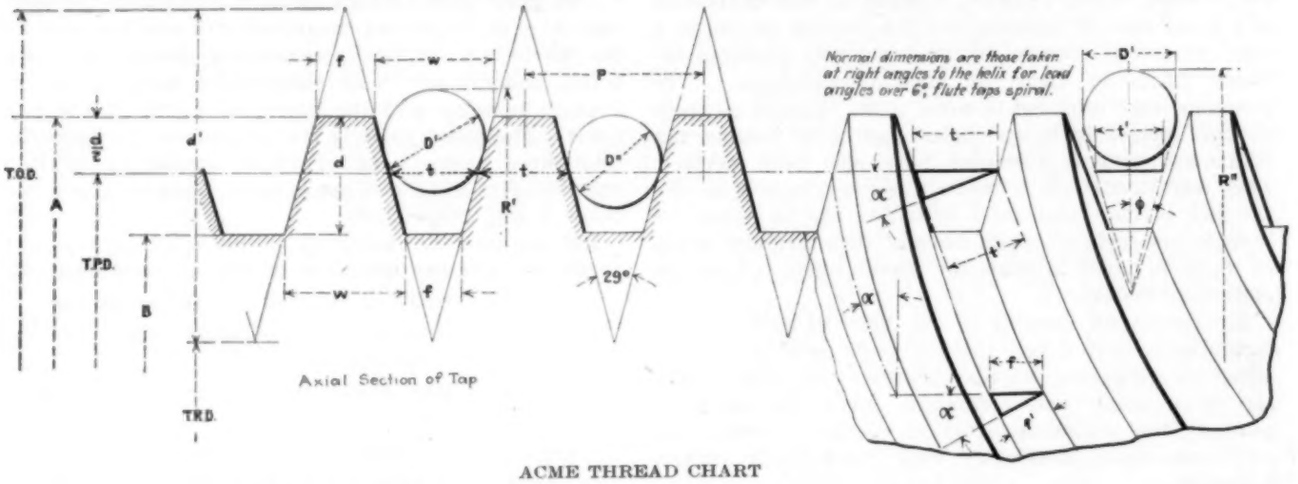
The National Screw Thread Commission does not differentiate between helix and lead angle but gives a formula for finding the helix angle. In my experience, however, the angle to which the workman sets his tool or work, is commonly known as the lead angle. In the Brown & Sharpe Gear Book, the formula is given:

$$\tan \alpha = \frac{\text{circumference}}{\text{Number of inches of spiral to one turn}}$$

But the author carefully avoids calling α the lead angle. Why should this uncertainty be allowed to continue? Is there no one progressive enough to say what is what?

To distinguish between the terms lead angle and helix angle, let us assume a universal milling machine set up to cut a helical flute in a tap, reamer, or similar tool. The table is swung from its zero position to the angle required by the helix and this reading represents the helix angle. The tangent of the helix angle is equal to: $\frac{\pi \times P.D.}{\text{Lead}}$

The lead angle is the angle between the helix itself and the plane normal to the axis of the work at the pitch diameter. It is the complement of the helix angle and its tangent is equal to: $\frac{\text{Lead}}{\pi \times P.D.}$ The *P.D.* in each formula represents the pitch diameter. This distinction is purely arbitrary and is set up solely for the purpose of making the formula clear. In my work, it is well understood but I do not know that the distinction is generally accepted. The following are examples of orders and inquiries that are made out correctly:



ACME THREAD CHART

T.O.D., *T.P.D.*, and *T.R.D.* indicate respectively the theoretical outside diameter, theoretical pitch diameter, and theoretical root diameter.

A = actual outside diameter of tap. The nominal outside diameter of the tap is the actual outside diameter of the screw.

B = root diameter of tap, and also of screw.

L = lead or advance in one revolution.

P = pitch or distance from center to center of adjacent threads.

N = number of threads per inch.

α = lead angle.

d = depth of thread.

d' = theoretical depth of 29-deg. V-thread.

f = standard width of tooth at top and standard width of space at bottom of thread. This is the commercially correct width of thread tool to use for lead angles up to six degrees inclusive.

f' = commercially correct width of thread tool to use for lead angles of over 6 degrees.

θ = $\frac{1}{2}$ nominal thread angle.

t = standard thickness of tooth or space at *T.P.D.*

t' = normal width of space at *T.P.D.*

w = standard width at top of tooth and standard width at bottom of tooth.

D' = diameter of any measuring wire, but must be same or greater than D''.

D'' = commercially correct diameter of wire having contact at *T.P.D.* when α is equal to or less than 6 degrees.

R' = commercially correct micrometer reading over three wires when α is equal to or less than 6 degrees.

R'' = commercially correct micrometer reading over three wires for lead angles over 6 degrees.

ϕ = $\frac{1}{2}$ the normal thread angle.

6 P.I. Acme Screw Thread, Double
6 P.I. 29-deg. Worm Thread, Double
6 P.I., ½-in. Lead, 29-deg. Screw Thread, Double

Give either the pitch diameter, the outside diameter, or both. The correct thread section will then be furnished. Other data, such as the number of pieces and the limits should not be forgotten. If 29-deg. threads are cut with thread milling cutters of the proper angle and width of flat, calculated from the formulas in IV, they will measure up to the correct sizes.

Everyone ought to know that 29-deg. threads when used on the lead screws of lathes, or on lifting jacks or valve stems, require a cutter with a flat wider than that of the cutter used to cut a worm thread, because of the difference in the root diameters. Manufacturers consider the word Acme as meaning screw, and, unless some reference is made to worm threads, will furnish Acme screw cut cutters.

If the foregoing paragraph is observed, there should be enough information sent out with each order to answer the five questions by means of the five formulas under IV. This information should prove to be of incalculable value to manufacturers and customers.

I. Formulas Commercially Correct for All Lead Angles Acme Thread Only

$$P = \frac{1}{N}; \quad N = \frac{1}{P}$$

$$L = \frac{1}{N \times 2 \text{ for double thread, 3 for triple thread}}$$

$$d = \frac{0.5}{N} + 0.020; \quad d = 0.5P + 0.020$$

$$\frac{d}{2} = \frac{0.25}{N} + 0.010; \quad \frac{d}{2} = \frac{P}{4} + 0.010$$

$$d' = \frac{1.9334}{N}; \quad d' = 1.9334P$$

$$A = \text{nominal outside diameter} + 0.020$$

$$B = \text{nominal outside diameter} - 0.020 - \frac{1}{N}$$

$$T.P.D = \text{nominal outside diameter} - \frac{0.5}{N} = \text{nominal outside diameter} - 0.5P$$

$$T.O.D = \text{nominal outside diameter} + \frac{1.43335}{N}$$

$$T.R.D = \text{nominal outside diameter} - \frac{2.43335}{N}$$

$$\cot \alpha = \pi \times N \times T.P.D. \text{ for single-thread taps}$$

$$\cot \alpha = \frac{\pi \times T.P.D.}{L} \text{ for multiple-thread taps.}$$

II. Formulas Commercially Correct for Lead Angles Up to Six Degrees Acme Thread Only

$$t = \frac{1}{2N} \qquad t = \frac{P}{2}$$

$$f = \frac{0.3707}{N} - 0.0052 \qquad f = 0.3707P - 0.0052$$

$$w = \frac{0.6293}{N} + 0.0052 \qquad w = 0.6293P + 0.0052$$

$$D' = \text{any wire with same diameter as } D'' \text{ or larger}$$

$$D'' = \frac{0.51645}{N} \qquad D'' = 0.51645P$$

$$R' = 4.9937D' - \frac{2.43335}{N} + \text{nominal outside diameter}$$

III. Formulas Commercially Correct for Lead Angles of Over Six Degrees Acme Thread Only

$$f' = \cos \alpha \left(\frac{0.37069}{N} - 0.00517\right)$$

$$t' = \frac{\cos \alpha}{2N} \qquad t' = \frac{P \cos \alpha}{2}$$

$$\tan \phi = \frac{\cos \alpha}{3.86670}$$

$$R'' = \text{nominal outside diameter} - \frac{2.43335}{N} + \frac{D'}{\sin \phi} + D'$$

$$\text{Minimum } D' = \frac{\cos \alpha}{2N \cos \phi}$$

IV. Formulas Commercially Correct for Any Lead Angle Any Form of Thread

$$f' = \frac{\cos \alpha}{2N} - \tan \phi \ (T.P.D. - B)$$

$$\tan \phi = \frac{\cos \alpha}{\cot \theta}$$

$$\cot \alpha = \frac{\pi \times T.P.D.}{L}$$

$$\text{Minimum } D' = \frac{0.5}{N \cos \theta}$$

$$R'' = T.P.D. - \frac{\cot \theta}{2N} + D' \ (1 + \csc \phi)$$

Automatic Control of Fire in Car Shops

A recent instance of fire control by the use of automatic sprinklers is of special interest to engineers and managers of shops of various kinds. The case in mind was the freight car erecting shop of the Turcot Works of the Canadian Car & Foundry Co., located near Montreal, Can.

The erecting shop is a large one-story building, 80 x 800 ft., all one area. The walls are of brick and glass in metal sash; the roof, light planks supported by unprotected steel beams and trusses. The distance from floor to roof is 39 ft. Five tracks run the length of the building. At the time of the fire they were filled with box cars, 75 in all. The shop is equipped throughout with a dry-pipe automatic sprinkler system controlled by six automatic air valves. Five metal fire curtains under the roof divide the system into six sections.

The fire broke out early in the morning of Oct. 17, 1922, in a box car in the center of the building. It was discovered by the watchman, who gave the alarm. A line of hose was stretched by the night shift at the plant but before this was brought into play the sprinklers overhead began to open. The fire burst through one end and the doors of the car and ignited the corners of nearby cars. The water from the sprinklers blanketed the blazing car and extinguished the fire in the nearby cars, thus confining the fire to the locality of origin.

The performance of the sprinklers was remarkable considering that the roof was 39 ft. high, and the nature of the obstructions to water distribution offered by the box cars. As the fire was directly beneath one of the divisional fire curtains the sprinklers in two sections opened, 10 in one and 11 in the other, 21 in all. The principal fire damage was to the burned box car, but no practical loss resulted, as the car was to be rebuilt. The damage to the building amounted to $50.00.

Federal Specifications for Leather Belting

The following is an extract from the specifications under which all purchases of leather belting will be made by the U. S. Government:

All belting leather shall be made from green salted hides and be free from brands, soft or spongy spots and open grub holes, excepting that when made into belting 30 per cent of the strips in any belt or roll of belting may contain a maximum of 3 open grub holes in each of such strips. The hides shall be tanned with oak bark or a combination of vegetable tanning materials. Animal oils and greases shall be used for stuffing the leather, or a mixture of these and mineral oils in such proportion as will provide maximum strength and pliability.

The use of epsom salts, glucose, barium chloride or other material for weighting the leather is prohibited. All leather after stuffing shall be thoroughly stretched while still damp and shall be left under tension until dry. The grain or hair side shall be finished smooth and the leather shall be thoroughly fleshed.

All strips shall be cut from the center portion of the hide at such distance from the backbone as to include only firm stock, and exclude second quality leather and at such distance from the root of the tail as will exclude all shoulder stock. No sectional strip shall be more than 54 in. in length, including the lap. The minimum length of any strip shall be 36 in. including the lap, excepting that in double belts ¼ of the total number of pieces may be between 20 in. and 36 in. provided that these short pieces do not occur consecutively. The minimum length shall not apply to the end pieces of rolls or cut lengths. In single belting the strips shall be joined shoulder end to shoulder end and butt end to butt end. In double belting the strips shall be joined shoulder end to butt end.

In all single belts 8 in. and over in width, backbone center strips shall be used. The backbone mark must appear running lengthwise approximately in the center of each strip. In all double belts from 8 in. up to 10 in. width, backbone center strips shall be used in one ply and the backbone mark shall appear running lengthwise approximately in the center of each strip. The other ply shall be cut from the location prescribed for first quality stock. In all double belts 10 in. and over in width, both plies shall be made from backbone center strips and the backbone mark shall appear running lengthwise approximately in the center of each strip. The same quality of leather shall be used in both plies of all double belting. The length of laps shall be within the limits given in Table I.

TABLE I—LENGTH OF LAPS IN INCHES

Ply	Thickness	Length of Laps	
		Belts under 6 in. in width	Belts 6 in. and over in width
Single	Under 10/64	2½ to 6	3 to 8
	10/64 and over	3 to 8	3½ to 10
Double	Up to 17/64	2½ to 3½	3 to 4
	19/64 and over	3 to 4	3 to 5

The minimum distance between any two laps in the separate plies of double belting shall be 8 in. The points of all laps shall be at right angles to the edge of the belt. All laps shall run in the same direction. The laps of both single and double belts and the plies of double belts shall be thoroughly cemented together. When pulled apart the cemented surface shall not appear glazed or shiny. The maximum variation from the nominal width shall be in accordance with Table II.

TABLE II—TOLERANCE FROM NOMINAL WIDTH

Width of Belting In Inches	Tolerance
Under 2	Not less than nominal
2 to 24 inclusive	1 per cent
Above 24	½ of 1 per cent

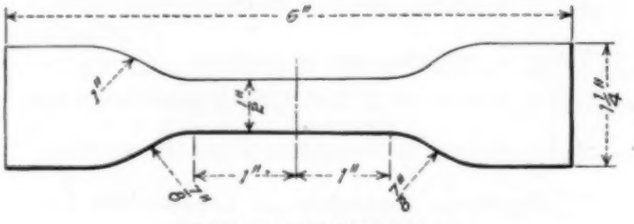
The thicknesses for the different grades of belting shall be in accordance with Table III.

TABLE III—AVERAGE THICKNESSES IN INCHES

Grade	Single Ply	Double Ply
Light	8/64 up to 10/64	15/64 to 17/64
Medium	10/64 up to 12/64	19/64 to 21/64
Heavy	12/64 up to 14/64	23/64 to 25/64

The average thickness shall be determined by measuring the thickness of 20 plies of the belt when rolled and dividing this value by the number of plies measured. No point in either single or double belting shall be more than $\frac{2}{64}$ in. thicker nor more than $\frac{3}{64}$ in. thinner than the average thickness. The excessive use of shims and filler strips and excessive splitting or leveling is prohibited. All belting shall be stamped on grain side with the maker's name and brand, and a stamp indicating the direction in which the belting is to run. Each stamp shall be repeated every 10 ft. throughout the entire length of the belting.

Waterproof dressed belting shall conform to all the requirements of this specification. In addition it shall be treated with a waterproof dressing. Waterproof belting shall conform to all the requirements of this specification. In addition it shall be treated with a waterproof dressing. The laps and plies shall be cemented with a waterproof cement. All leather shall have a minimum tensile strength of 3,000 lb. per square inch of cross-section and an average tensile strength for single belts of 3,750 lb. per square inch and for double belts of 3,500 lb. per square inch. The average shall be determined with five test specimens cut continuously lengthwise of the sample, omitting the lap. Test specimens of the shape and size as shown in the illustration shall be cut with a metal die.



THE TEST SPECIMEN

The laps of both single and double belting shall not open when subjected to a tensile stress of 2,500 lb. per square inch. The opening of the laps shall be determined by testing two specimens cut across the point of the lap lengthwise of the sample. For double belting the test shall be made on the single ply. The average elongation at a tensile stress of 2,500 lb. per square inch shall not exceed 15 per cent. The average shall be determined with the same five test specimens used for determining the tensile strength.

The following stretch test shall be made on the finished belting up to and including six inches in width.

Copies may be had from the U. S. Bureau of Standards, Washington, D. C.

Any section of a roll or belt shall be selected (which shall not be cut) on which gage marks shall be placed 10 ft. apart. Suitable clamps shall be attached on the marks so that the distance between the clamps shall be 10 ft. The section shall then be suspended in a vertical position from one of the clamps. Sufficient weight, including the weight of the clamp, shall be attached to the lower clamp to produce a tensile stress of 750 lb. per square inch of the average cross-section of the section being tested. The section after being subjected to this tension for 15 min. shall show a length between the gage marks not to exceed 10 ft., 7.2 in. (6 per cent stretch).

The clamps shall then be removed and the section allowed to lie loosely on the floor for 17 hr., after which time the length between the gage marks shall not exceed 10 ft. 1.6 in. (1⅓ per cent stretch). The leather shall not crack on the grain side and the laps shall not open at the points when the belting is bent through angles of 180 deg., grain side out over forms as specified in Table IV for the different grades and thicknesses.

TABLE IV—FORMS FOR CRACKING TEST

Belt	Average Thickness Belting Inches	Diameter Form Inches
Single	Under 10/64	1
	10/64 and over	1¼
Double	Up to 17/64	3
	19/64 and over	4

The leather shall not show wrinkles on the grain side (commonly called piping, and indicating looseness of fiber found in side stock or second quality belting), when bent through an angle of 180 deg. grain side in, over forms as specified in Table V for the different grades and thicknesses.

TABLE V—FORMS FOR PIPING TEST

Belt	Average Thickness Belting Inches	Diameter Form Inches
Single	All	2
Double	Up to 17/64	4
	19/64 and over	6

A sample waterproof dressed or waterproof belting, 12 in. long, shall be weighed and then immersed in water at room temperature for 5 hr. When removed from the water the sample shall be wiped and again weighed. The percentage of water absorbed shall not exceed 8 per cent. This test shall be made on every lot of 2,000 ft. or fraction thereof. The sample of waterproof belting tested for water absorption shall be again immersed in water until the total period of immersion is 24 hr. The sample, after removal, shall be allowed to dry under room conditions for 24 hr. The laps and plies shall not open when the sample is bent around the proper form as specified in Table IV.

Brains vs. Hands

By O. C. Richards

We are told repeatedly that the day of the old time foreman is past and that the successful department head of today is quite a different sort of a man from the boss of a few years ago. There is a certain type however that is met with, not infrequently, even in some of our shops that pride themselves on their progressiveness. It is the foreman who wears himself out physically. He performs with his own hands tasks that belong properly to those of others and, in so doing, fails to concentrate his efforts on the more important duty of directing those under his supervision. After being a department head for a number of years, time study and method work presents to me an opportunity for observation that is particularly interesting.

The head of a large department used to spend the first two hours of every morning personally in counting and moving parts from one section of his department to another. This work could have been done by any laborer able to read and write. Later in the day other hours were spent in other sections of the department in much the same manner. In another instance, an assistant superintendent was very anxious to get a greater production from his assembly department. For days at a stretch, he spent practically all of his time in this particular department, with hammer and wrenches, assisting in the actual assembling. The increased production from that particular bench was about the same as would have been obtained by hiring an extra man at the gate. He was the butt of the jokes of the workmen and lost much of the respect of his foremen.

Recently I was engaged in studying a job of rough, unskilled work that involved a considerable amount of handling, several men being employed on the same task. The men were very awkward, particularly in the handling, and needed the attention of their foreman to get them lined up on the job. The foreman, at this particular time, was engaged in placing castings on the benches with a hand controlled electric crane. He was busy at this for over an hour, feeling no doubt, that he was doing his best for the company.

The duties of an efficient foreman require all the energy that he possesses and he cannot afford to wear himself out at tasks that are not concerned with the management of his department. Men can be obtained at a small hourly wage to do all the things of a menial nature. It is far more profitable to take a workman off a production job than for the foreman to neglect his own duties for such things.

A foreman has, of course, a multitude of duties but certain functions stand out so prominently that he must always bear in mind the fallacy of letting anything interfere with them. A considerable amount of time can well be spent in a systematic watching of the quality of the work being produced. The quality will never be higher than the standards demanded by a foreman. A foreman with an eagle eye on the character of the work will have a wonderful effect on the product. Improvements cannot be thought of and worked out by a foreman who is trying to save the price of a day laborer. Also the instruction of new operators is something that is a real art if properly performed. Even if special instructors are assigned to teach the beginner, the foreman will be well repaid for special personal attention in getting him started off right.

A really efficient department head is very careful to keep in touch with the workmen and their troubles. He cannot afford, of course, to become so familiar that he loses the respect he must have in order to be successful. Men like to feel that their foreman is interested in their complaints and it will be found that most of the differences of opinion arising between the men and the management can be settled satisfactorily to both parties if they are taken care of promptly.

It is not an indication of laziness or false pride for a foreman to avoid actual physical labor. His hands can perform no more than one of his workmen while his brains, if he has been properly picked for his job, are worth many times as much to the management.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Carbonizing by Means of the Acetylene Torch

By Milton Wright

In the self-starting device that has become an indispensable part of the modern automobile it is the usual practice to cause the teeth of the pinion of the starting motor to enter endwise when engaging with the corresponding ring gear. The engagement is brought about by sliding the pinion lengthwise of the rotor shaft and, as this action takes place very suddenly and as the teeth of the pinion and ring gear cannot well be expected to be always in exact alignment at the moment of engagement, there is bound to be more or less interference at the ends of the teeth; resulting in rapid wear, both by abrasion and by impact.

Heat treating the pinion to prevent rapid deterioration is a simple matter, but, as the teeth of the ring gear are ordinarily cut directly upon the periphery of the engine flywheel, the heat treatment of this part is quite another matter and it thus becomes a question of making the gear a separate part and shrinking or otherwise securing it upon the fly-wheel involving complications and added expense—or of leaving the gear teeth soft. If the teeth are soft a burr will soon be thrown up by the continued engagement of the starter pinion, causing still further interference and militating against smooth and sure action of the starter.

It is not necessary, nor is it even desirable, to make the entire tooth surface of the ring gear hard, for the trouble is all at the extreme ends of the teeth. The

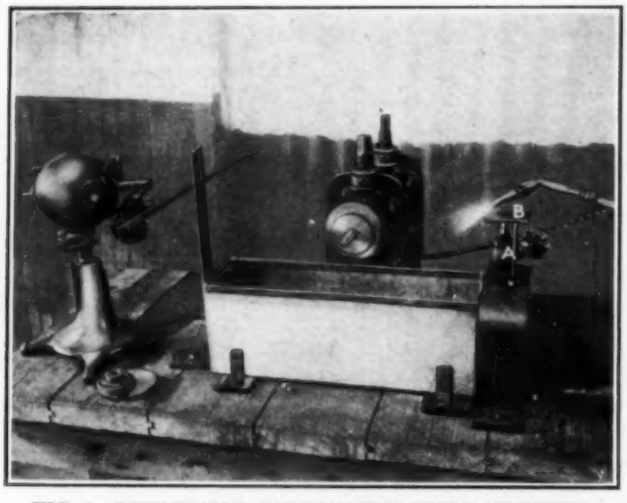


FIG. 1—DEVICE FOR CARBONIZING ENDS OF TEETH IN RING GEAR

ideal condition, therefore, is a soft tooth section with a hard surface only at the entering end. At the plant of the Locomobile Co. of America, Bridgeport, Conn., the problem has been solved in a satisfactory way by what is believed to be a unique application of the acetylene torch; devised by D. G. Roos, production manager of that company.

In order to show the complete working of the method, two photographs of the device—which is at once simple and ingenious as well as effective—are here presented. Fig. 1 shows the device without the work in place and with the acetylene flame burning, while in Fig. 2 a fly-wheel may be seen in place but with the gas turned off, for if the flame had been allowed to play upon the

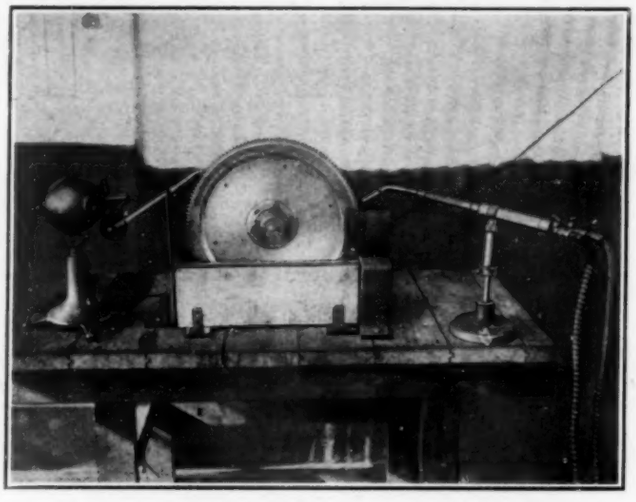


FIG. 2—THE DEVICE WITH A GEAR IN PLACE

stationary gear for the length of time necessary to make the photograph the usefulness of the part would have been destroyed.

The device consists of a standard acetylene torch, with a support to hold it in place; two ordinary shaft hangers with a short special shaft mounted in the bearings to carry the gear to be treated; a box, or trough, of galvanized sheet iron to collect and carry away the water and an electric fan motor from which the fan has been removed and a worm gear speed-reduction device fitted to the shaft to operate a pawl.

Referring to Fig. 1, water is delivered to the device through the valve at *A* and issues from a small jet beneath the platform *B* and directly below the jet of flame. With the gear (fly-wheel) in place as in Fig. 2 the flame plays directly upon the end of a tooth at the point where the latter will contact with the starter pinion and during the interval that the gear is allowed to remain stationary, only the corner of the tooth, is heated to the necessary carbonizing and hardening temperature. The pawl then operates to advance the gear one tooth and the red-hot tooth passes below the platform and stops opposite the quenching jet where it remains during the interval that the next tooth is being heated.

The object of the platform *B* is to keep the flame away from the water jet. It is but a piece of heavy sheet metal and, if corroded by the action of the flame,

is easily replaced. The sheet metal trough is for the purpose of confining the water and prevent it from splashing about. It need not (and does not) contain water, as a drain pipe immediately carries away the surplus.

As the gear is of mild steel it is necessary to carbonize the surface to be hardened, and the carbon for this purpose is already at hand in the acetylene flame. As may be seen from the appearance of the flame in Fig. 1, it is burning with a minimum of oxygen, an amount of this gas just sufficient to bring the temperature to the desired degree being supplied while the heated tooth is enveloped by the surplus carbon-carrying acetylene. A thin shell of carbonized material is thereby formed upon each successive tooth while it remains in the flame. The tooth then passes immediately to the quenching jet below the platform as the pawl advances the gear.

Once set in motion the operation of the device is continuous and automatic until all of the teeth have been carbonized and hardened. The pawl operating mechanism upon the motor shaft is so timed as to allow the gear to remain stationary for seven seconds, which time has been found by experiment to produce satisfactory results, and to consume about one second in advancing the gear. As there are 138 teeth in the gear it easily may be calculated that the output of the device is about three gears per hour, including the time of changing. It requires no attention after starting.

Crosshead Pin That Will Stay Tight —Discussion

By J. T. Towlson
London, England

On page 309, Vol. 57, of the *American Machinist*, there appeared an article under the above title by C. D. Michener. While the pin described by Mr. Michener is good in a way, I do not like it as there is no protection against sidewise movement in either direction should the pin get loose. I should very much fear to use such a pin in "out-of-sight" places, especially for fear it would become adrift as a result of endwise movement.

Retaining the idea of the split sleeve and the expanding mandrel, protection could be given to dangerous

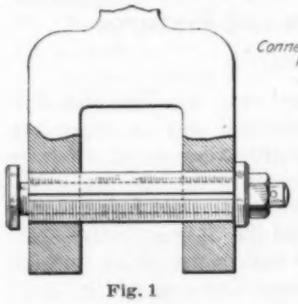


Fig. 1

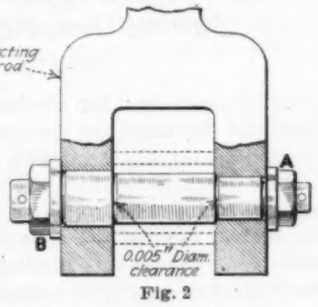


Fig. 2

FIG. 1—MODIFICATION OF C. D. MICHENER'S CROSSHEAD PIN. FIG. 2—AN ENGLISH STAY-TIGHT CROSSHEAD PIN

endwise movement by providing a head to the expander and a washer larger than the diameter of the split sleeve for the opposite end; leaving a margin of clearance at the "head" end of the expander for tightness when required, as shown in Fig. 1.

A dependable method, adopted by engine makers with whom I am acquainted, is shown in the sketch, Fig. 2. There is, however, one essential requirement for the success of this device, which is not shown in the sketch. It is this: The pin is of chrome-vanadium steel, with all diameters ground to a glass surface. The bore of the connecting rod is bored under size, corresponding to an allowance for a hydraulic pressure fit. The pin, greased with lard oil, is pressed in by hydraulic pressure and then pressed out again by the same means, the useful effect being to burnish and harden the fitting surfaces of both the pin and the hole in the rod.

In assembly, the pin is pulled in by means of the nut *A* and is withdrawn by the nut *B*, the closing in of the jaws of the rod being prevented by the crosshead being in place. A pin so fitted will stay tight, while the center part on which the crosshead brasses wear may be shimmed up when elliptical wear takes place.

Limitation of Piston Aligning Gages —Discussion

By Stanley W. Mills

Under the above title on page 659, Vol. 57, of the *American Machinist* J. T. Towlson criticises the conventional type of gudgeon or wrist pin used in the gasoline engine and suggests a design of ball socket in the piston as a substitute. Both his criticism and suggested improvement are distinctly open to argument.

In the first place, his proposal, entirely apart from the number of parts and consequent complications, involves just as much, if not greater, accuracy in manufacturing as the conventional type of pin bearing in bosses at right angles to piston axis. The removable socket or pad which he shows is in itself a costly piece to make and could not be successfully machined without a great deal of care. It would be a costly and difficult problem to machine the ball end on the rod in line with the large end, without the use of expensive and accurate fixtures and it should be obvious that if the slightest errors exist in the finished pieces, the rod would be cramped when in position in the engine and inevitably cause trouble.

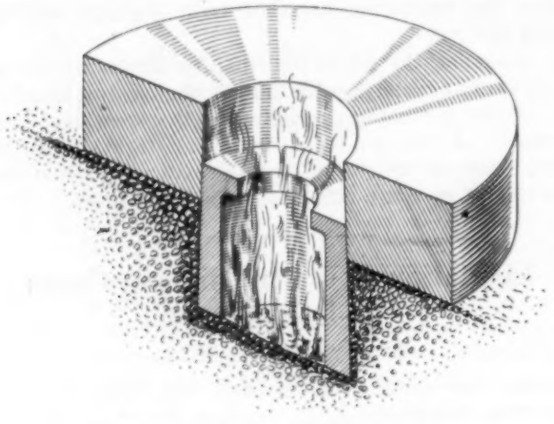
I venture to dispute Mr. Towlson's statement that with a ball socket, the rod is tractable in all directions, unless the greatest accuracy is maintained with respect to concentricity of the socket with the piston, correct alignment of the ball with the large end of the rod and the position of the cylinder on the crankcase. There are other details which I feel would never work out in practice, such as the inadequate means for locking the cap, the objectionable feature of drilling the piston skirt in order to insert the lock screws and the apparent impossibility of assembling the adjustable cap unless made in halves, which would be an impractical construction.

It is of course a fallacy to adhere blindly to past practice just for the reason that that is the way it has always been done. On the other hand, however, a time tested construction such as the conventional form of wrist pin (which in essentials has not been changed since gasoline engines were first produced) is undoubtedly based on a sound foundation. I can state positively that today the straight type of wrist pin, either floating in both rod and piston or clamped in one and bearing in the other, represents the best, most modern, and fool-proof design.

Closing-In Small Round Dies

By P. L. Stohr

Small round dies that have become worn oversize in service can be reclaimed with very little trouble by the following simple method. Bore out a casting, as shown in the sketch, to a drive fit for the die and drive the die into it for a short distance. Lay the die and casting on



CLOSING-IN SMALL ROUND DIES

the forge fire so that the flames will draw up through the hole in the die. As the die becomes heated in the center long before the larger casting, the expansion of the metal will close in the hole and when the casting has become hot the die will drop out into the fire; when it is ready to be hardened in the usual way.

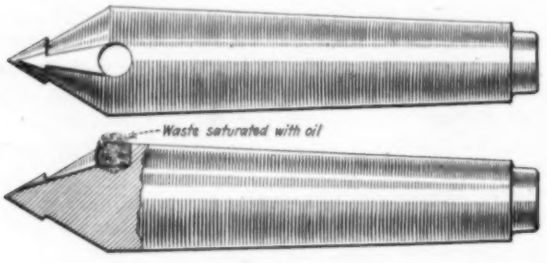
The hole will usually be found so much smaller than before as to require regrinding to size.

Saving Time in Grinding Centers —Discussion

By W. H. Storey
West Croydon, England

Under the above title on page 234, Vol. 57, of the *American Machinist*, Charles Kaufmann illustrates a center which is certainly a time and grinding wheel saver.

Personally I cannot understand why centers are turned solid as they usually are, presenting to the grinding wheel a face of about 1½ in. of which usually



TAILSTOCK CENTER WITH OIL GROOVE

less than ¾ in. is used. I found grinding such centers to be a great waste of time, particularly when using a small portable grinder attached to the lathe carriage, and so I had all the centers in the shop cut away identically as shown by Mr. Kaufmann, but, in order to make a further saving in grinding by eliminating it as far as possible, I had a lubricating groove cut out in the tailstock center as shown in the illustration.

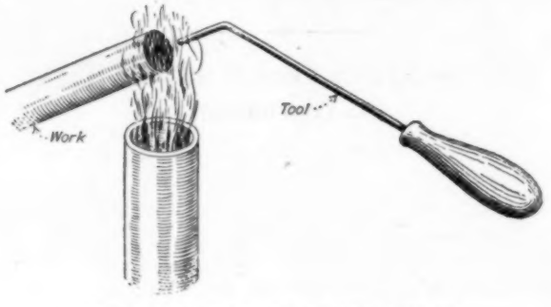
In the top portion of this groove, which is countersunk by means of a drill, a small pad of cotton waste is kept. The waste is saturated with oil which slowly drips right on to the point of the center. If insufficient oil is dripping, all the operator has to do is to press the waste slightly with his finger, forcing a little of the oil out.

A center made with an oil groove as above described will eliminate the necessity of the constant use of an oil can or any of the other usual means of lubrication. Moreover such a center is not liable to be burned, even through the inattention of a careless operator.

Tinning Small Holes

By E. Lytton Brooks
London, England

A piece of copper wire that will easily float or move about in the hole is bent at one end slightly longer than the depth of the hole; cut off about 6 in. long and handled. A piece of round wood or small file handle serves nicely. The work is then heated in the gas flame with solder and flux in the hole, and the copper wire end moved about in it until the inside of the hole



WIRE FOR TINNING SMALL HOLES

is tinned. The copper wire becomes tinned almost immediately and behaves like a small soldering iron. For electrical work paste and acid fluxes should be strictly taboo.

Storing Dies, Jigs and Fixtures

By S. N. Bacon

Wooden shelves for storing heavy punches and dies, jigs and fixtures are uneconomical due to wear and breakage and the standard adjustable metal shelving will be found to be more satisfactory in every way. The usual practice seems to be to locate the heaviest tools on the shelves nearest the floor and the lightest tools on the top shelf. While this method makes use of all possible shelf space a better arrangement and one which facilitates the transfer of tools to the machine and back to shelving is to locate the heaviest tools upon a shelf the same height from the floor as the bed of the machine upon which the tool is to be used. A truck of the proper height should be used and if constructed of wood, the top should be covered with sheet steel without seams or rivet heads, thus providing for sliding the heavy dies and fixtures from the shelf onto the truck and from the truck to the bed of the machine. The shelves below as well as above are used for storage of light and medium weight tools only.

Making Small Shoulder Studs in Double Lengths

By K. H. Crumrine

A line drawing of a shoulder stud of a design commonly used in machine and tool construction is shown in Fig. 1. Many such studs are made on lathes or screw machines and are used without being ground. Others, however, are required to be ground on all diam-

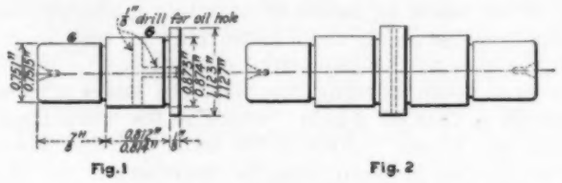


FIG. 1—THE STUD TO BE MADE. FIG. 2—TWO STUDS MADE IN ONE PIECE

eters, and many must be hardened before grinding. Studs of this type, when made in single lengths, present certain difficulties in grinding. One difficulty is that the distance between the grinding centers is so short as to make it hard to grind the pieces straight. Another difficulty is presented in holding the studs by the short heads for driving, so that both of the principal diameters can be ground at the same setting. In view of these difficulties in grinding when made in single lengths, the double length method as used in our shop may be of interest.

The stud shown in Fig. 1 must be hardened and ground on the two smaller or principal diameters and the shoulder under the head must be hard. The stud is made of low carbon machinery steel and carbonized preparatory to hardening. Pieces long enough to make two studs as shown at Fig. 2 are cut off, allowance being made for the parting tool, plus the usual amount necessary to finish the ends. The stock used must be larger than the largest diameter of the stud by an amount sufficient to permit all carbonized metal to be removed from the diameter of the heads after the pieces are carbonized. Next the pieces as cut are centered, the ends squared up in a universal chuck on a lathe or in a collet on a screw machine, the two smaller diameters turned to grinding size and the grinding recesses cut in. The heads or largest diameters of the studs must not be turned at this time but left as large as possible until after carbonizing.

The studs are now ready for carbonizing but after this process are not immediately hardened. Instead they are returned to the machine shop where the excess material is turned off the heads and the cross holes drilled. Turning the carbonized material from the large diameter makes it impossible to harden the heads except under the shoulders and leaves the heads in suitable condition to be cut by the parting tool at the proper time. If the cross holes had been drilled previous to carbonizing, their surfaces would have been carbonized sufficiently to harden and would have made it extremely difficult to drill into for the small oil holes in the ends which are put in later. Next the studs are heated and quenched for hardening and are then ready to grind. Although the double length method of making these studs provides a most convenient way to drive for turning it is in the grinding operation that the value of this method becomes most apparent, as each stud can be completely ground at one holding, being driven by a dog attached to the stud on the opposite end.

After grinding, the studs are ready to be separated and for this operation are cut with the usual parting tool. Next the ends are finished and a spot made in which to start the drill for the small oil hole in the end. The oil holes are drilled in a high speed drilling machine in a separate operation. Should the number of studs required be large, they are made from the bar in a screw machine. A stud is made and centered as usual, but instead of cutting off to length, enough stock is fed out and cut off to make another stud on the opposite end as a second operation. After this the procedure is the same as for the smaller lots.

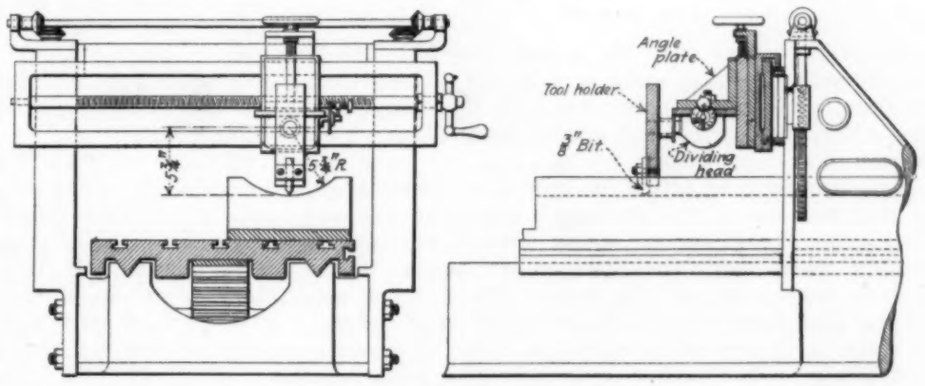
Radius Planing With a Dividing Head

By Robert T. Wilson

The sketch shows how a job of radius planing was done on an ordinary planer by the use of a dividing head from the milling machine, and without a great deal of extra rigging. This adaptation was made and the work done in this way for the reason that we did not have a lathe or boring mill large enough to handle the piece.

The clapper box was removed from the vertical slide of the planer and an angle plate bolted in its place, thus giving us the advantage of the regular vertical feed. The dividing head was secured to the under face of the angle plate with the spindle parallel to the planer table. A piece of cast iron was bored and threaded to screw on the spindle nose of the head in place of the regular chuck or driving plate and at the end of the piece a radial groove of square section was made to accommodate a commercial tool bit, which was held in place by a clamp and stud bolts in much the same way as a planer tool is ordinarily held.

By setting the point of the tool to the required radial distance from the center of the spindle the radius was planed by feeding the tool at the end of each stroke of the planer table by means of the regular index crank on the dividing head. The casting had been cored to approximately the desired shape and we were thus able to remove the amount of metal necessary to secure a good finish.



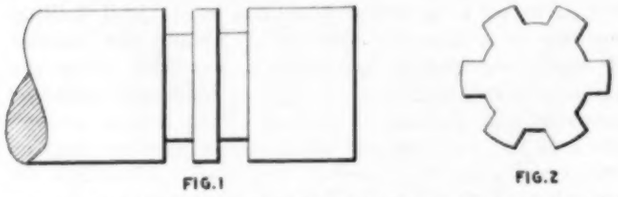
RIG FOR RADIUS PLANING

Thread Milling Cutters and Hobs

BY A. NUGENT
Cork, Ireland

A consideration of the elements of the square thread and the modern method adopted for producing it by the process of milling, is helpful when considering the production of circular cutters for this purpose and also the production of hobs for splining and for square and hexagon shafts and kindred work.

Examination of the sketches will show that the annular spaces around the periphery of a cylinder, Fig. 1, and the longitudinal cuts shown in end view, Fig. 2,



FIGS. 1 AND 2. EXTREMES OF SQUARE THREAD SECTION

are essentially two extreme forms of the square thread. In Fig. 1 the helix angle is zero and in Fig. 2 infinity. The square thread screw then, in all its wide variations of lead, pitch and diameter, is logically some intermediary between these two extremes.

Once we depart from the conditions of the annular spaces Fig. 1 in the direction of the conditions shown in Fig. 2, the helix angles, which for the top and bottom of the thread alike are zero in the first case immediately become two different dimensions, both varying as the lead of the thread.

If we lay out a square thread to a fairly large scale and superimpose the outline of a side and face cutter of a width equal to half the pitch we will see that such a cutter could not produce a thread whose longitudinal section is a true, or approximately true, square.

The deformation is due to the interference of the

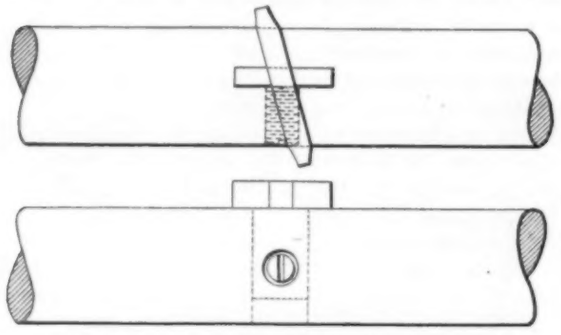


FIG. 3. SETUP FOR OBTAINING THE FORM OF CUTTER

sides of the cutter with the spirally disposed side of the thread as it enters and leaves the cut. The amount of this interference will increase with the diameter of the cutter, the depth of cut, and the lead of thread, for a given diameter of blank.

The true form of cutter for milling a square thread is therefore not of the standard rectangular side and face cutter form but one whose teeth have a curved outline, which curve does not conform to any of the regular curves and is only strictly true for one particular lead, depth of cut and blank diameter of screw.

While it is possible to arrive at this correct curve graphically, such a method involves complex geometrical projection and is in fact of little use to the toolmaker, even when done with the greatest care. The better and more practical way is to generate the desired curve by setting up the machine as though for milling the actual screw, then by mounting on the cutter arbor a blank made of some free cutting metal, such as white metal, we may slowly feed astride this rotating blank a line form tool of the thread space Fig. 3, held in an arbor placed between the work centers of the thread milling machine. An appropriate curve is thus accurately generated which can be afterwards transferred to a tool steel cutter blank by means of carefully made male and female transfer gages and a form relieving tool.

In the case of the generating of splines, this is done on a gear tooth hobbing machine, the basic principle of which is that of a gear (which is the work blank) rolling into a rack (which is the hob), and the natural, mutual alliance between these two members is the regular involute curve.

We have seen, however, in the case of splining that we are fundamentally generating an extreme form of

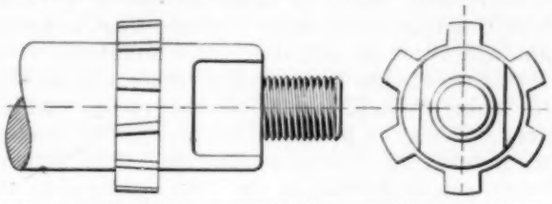


FIG. 4. SHAPE OF CUTTER FOR SPLINED SHAFTS

square thread whose sides consist of straight lines parallel with each other and with a radial line drawn through the center of the thread. In this case the action between hob and work is not rolling contact and requires a hob with a special form of tooth made to a given size and number of splines and a given blank diameter.

We can best arrive at this true form by setting up the hobbing machine as for splining the actual shafts and placing between the work centers a cutter, Fig. 4, whose cutting outline conforms exactly to a cross section of the splined shaft desired. On the hob spindle we then mount a hob blank, previously threaded approximately to the one desired as to pitch, depth of cut and diameter, but made from some free cutting metal as previously indicated, and left sufficiently long to span the arc of contact between itself and the cutter.

The cutter, Fig. 4, will then generate the true shape of hob tooth. By transferring this shape to gages we have a permanent means of reproducing accurate form relieving tools for repeating any further hobs that may be required for that particular size of splined shaft.

Another modern application of the hobbing machine is to the generating of shafts having square, hexagon and other symmetrical sections but which, like the splined shaft, have not the rolling contact relationship involved when hobbing involute gear teeth. In these latter cases hobs with special tooth forms are necessary, and are best arrived at as indicated in the case of splining hobs.

In designing these hobs it should be noted that the normal pitch of the hob must correspond with the circular pitch of the splines, or, in the case of squares or hexagons, with the circular pitch of the points of the cross section. On this account by varying the hob diameter we can, within limits, determine an axial pitch of our hob which will greatly convenience the toolroom when making it. This is evident when the axial pitch of hob $= P$, pitch of splines $= S$, and helix of hob $= A$ degrees. Then: $P = Sx$ secant A.

Editorial

WE WOULD GLADLY invest a hundred dollars if we could be certain that we would get ten thousand in return. Our enthusiasm would still be considerable if we got only one thousand or five hundred or even two hundred. But when it comes to production in the shop we seem to have the idea: ten thousand, or nothing. Just because the profit is not so great we refuse to employ the automatic machine for smaller quantities; we seem to feel that, if it takes three hours to set up the machine, we must gain at least a hundred. Why not take paper and pencil and figure it out?

Standardizing Names of Machine Parts

THERE SEEMS to be no question that the work of standardization which has been going on more or less spasmodically is taking definite root and that we are to have workable standards for many machine parts.

There is, however, a great need of standardization along a line which is too generally overlooked, namely, the standardizing of the names of machine parts, particularly those which are widely used in general machine construction. Take for example, machine screws and bolts with their variety of heads. There is not even an accepted definition as to what a machine screw really is, and when it comes to the shape of the head or the length of the thread we are all at sea.

We heartily approve standardization along rational lines, and we sincerely believe that a standardized nomenclature is of prime importance.

Grinding Machines and Some of Their Problems

THE INCREASING use of grinding as a method of machining metals of various kinds emphasizes more and more the problems which confront both the makers of grinding wheels and grinding machinery, and those who use them in finishing their product. The varying conditions of wheel contact introduce elements which require careful study, but which are too often overlooked by those who see the matter from a superficial standpoint.

A little study of the amount of contact between wheel and work on both internal and external cylindrical grinding, with various sizes of work and of wheels, will soon show the necessity of having various grades of grinding wheels even for the same materials. When it comes to surface grinding it is only necessary to study the entirely different conditions when using the periphery of a narrow-faced wheel or when grinding with a large ring wheel on a surface having considerable area. Here the problem of a continuous or a broken surface must also be met and the wheel selected in accordance with the work.

Then, too, there is the problem of the way in which the grinding-wheel spindle fits its bearings, and the effect of heat in tightening these bearings or in making them more free. In too many cases the wheel spindle bearings receive much more careful attention than the mounting of the work to be ground, and there are doubtless many instances where more perfect work could be secured if more attention were paid to this end of the operation. There is a growing tendency toward wide wheel work and toward more simple machinery.

The whole problem is one of much interest and in which there is ample opportunity for improved design and construction, as well as for skill and experience on the part of the operator.

The Growth in the Number of Aircraft Industries

THOSE WHO FAIL to realize what has actually been done in airplane development and use, and think of it only as a future possibility, are not only lagging behind the procession but are likely to miss considerable business from time to time. For while the output of airplanes is insignificant as compared with the automobile as yet, there are nevertheless several thousand men engaged in the industry which is already providing a market for a large number of machine tools of the higher grades.

As an indication of the activities already under way it is only necessary to note that 72 firms engaged in the manufacture of materials, parts, accessories or supplies are members of the Aeronautical Chamber of Commerce, the national body which embraces nearly all the concerns engaged in airplane development. As an example of the way in which the airplane industry affects other fields, one large concern has made a comprehensive study of metals for airplane work and as a result is supplying the bulk of the bearings for the new airplane motors and also for replacements at the various flying fields.

Machine builders of all kinds will do well to give more attention to the airplane to aid in its development. One of the ways to help this development is to work for suitable landing fields in every city, as these must precede the commercial use of planes on any large scale. Those who are in a position to profit by the development of aircraft should lose no opportunity to put their shoulders to the wheel while the industry is still young and help to educate the public to its possibilities.

Just Suppose

JUST suppose you were an old engine lathe in a railroad shop and that you had been working hard for forty years. And suppose you had rheumatism and St. Vitus' dance and every move you made was agony and you couldn't do your work the way you used to so that your self respect was gone.

You'd give all you possess to have the superintendent come around some day and order you put on the scrap pile so that your miserable existence could be ended.

Railroad shop superintendents don't do humane things like that? Of course they don't, the management won't let them, but—

Just suppose.

Shop Equipment News

Bullard Continuous Turning Machine

The Bullard Machine Tool Co., Bridgeport, Conn., has recently added to its line of vertical machines, the newcomer being the continuous turning machine illustrated in Fig. 1. The turning machine maintains the Bullard characteristics in being vertical, in the use of multiple tools which turn, bore and face without the use of form or sweep tools and in the use of tool slides with large bearing surfaces, of simple tools which are easily adjusted and of flood lubrication to all working surfaces. While at first glance the machine may be likened to the Mult-Au-Matic, it is a distinct departure from it in a number of ways.

As the name implies, the machine is of the continuous instead of the station type. In the latter the tools remain stationary and the work tables are indexed under the different tool heads for each operation. In the former, both the work and the tool head move continuously around the center column and all indexing is avoided. Each operation is performed in less than one revolution of the carrier, a portion of its revolution being reserved for loading the work in the chuck. In the machine shown the loading time is a trifle over one-fourth of the cycle.

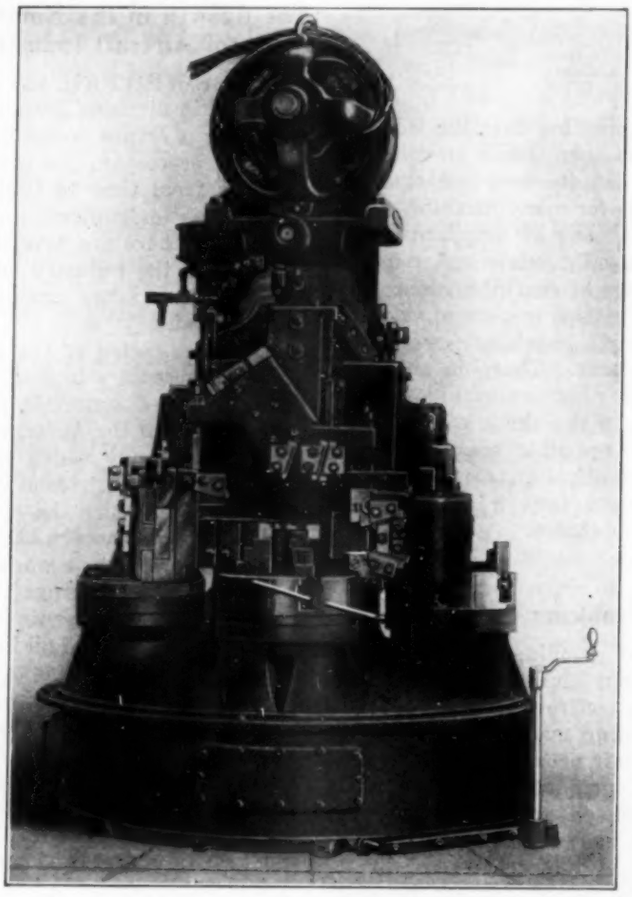


FIG. 1—BULLARD CONTINUOUS TURNING MACHINE

The continuous turning machine is built around a central column, which carries the motor at the top, and just below it the single cam that actuates and times all the tool slides. Everything below the cam revolves around the central column, the work tables being revolved under the tools except during the loading period. A shaft in the center of the column drives a large ring gear, which in turn drives each work table by meshing with a gear larger than the table itself. The gears are automatically engaged and disengaged as in automobile transmissions without the use of clutches. The large carrier which supports the work tables and carries them around the central column is driven by a large wormgear, also actuated from the central power shaft. The speed of the carrier can be varied by changing a single pair of gears, no gear box being necessary.

The detailed view, Fig. 2, gives a good idea of the construction of the tool heads and the work they do. The work shown is a tractor flywheel, weighing about 140 lb. in the rough, this being the first operation. The wheel is held on the inside by the chuck jaws, the piece being chucked during the part of the cycle when the work table is idle. The tool at the left rough turns the outside; those at the right feed toward the center, facing both sides and chamfering the corners after the face has been turned by the tool at the left. The side movement is secured by rack and pinion from the vertical slide.

At the same time, the tools in the central tool slide feed straight in to the work as far as the stops permit and are then moved toward the left by the angular slide as the main slide continues to be forced down by the cam at the top. These operations take approximately three-quarters of the revolution of the carrier, the amount being determined by the work being done. The tools are withdrawn and the table stopped when it reaches the loading position. The piece is removed and another put in its place, ample time being allowed for this work during the idle period.

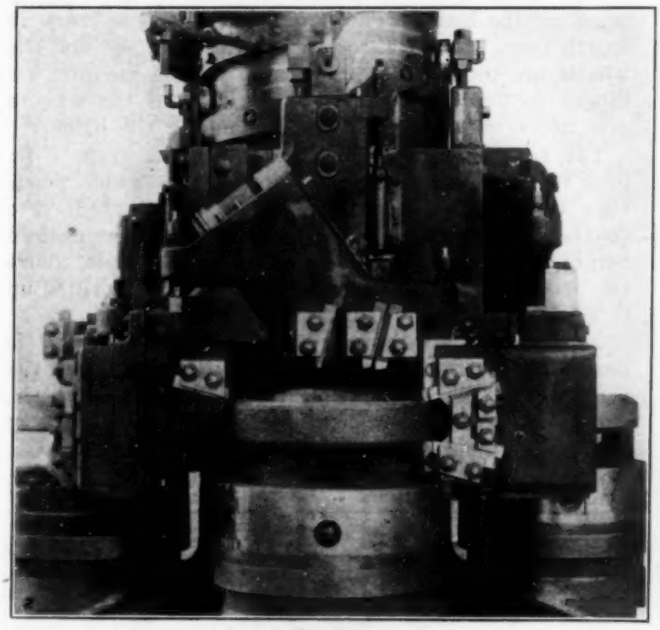
In the meantime the second operation is being performed by the next tool head, as shown in Fig. 3. As soon as this head reaches the loading point, the finished wheel is removed and the one just rough turned on the first spindle is turned over and chucked as shown. In this operation the machine bores and faces the inside of the wheel at the hub, only three tools being used. Here again the tools are held in the angular slide, which feeds straight down to the work until stopped by the adjusting screw stops at each side. The continued movement of the main slide forces the tool head to the left, thus facing the hub. The view shows also the small oil dash-pot at the right of the main slide to cushion the movement of the slide as it drops down the steep part of the cam. The retarding or dragging action on the tool slide prevents digging in of the tools. The illustration likewise shows the construction of the tool slides, the size of which can be estimated by comparing them with the work table, which is 18 in. in diameter.

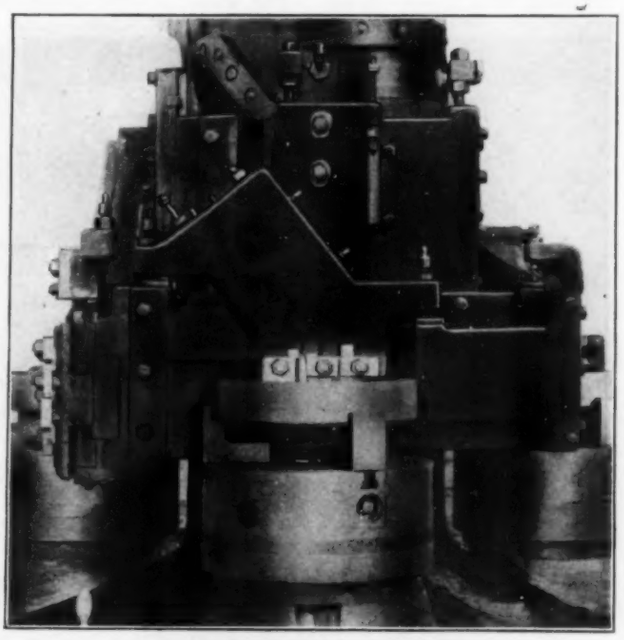
The third operation is also on the inside of the flywheel, this operation being the finish boring, facing

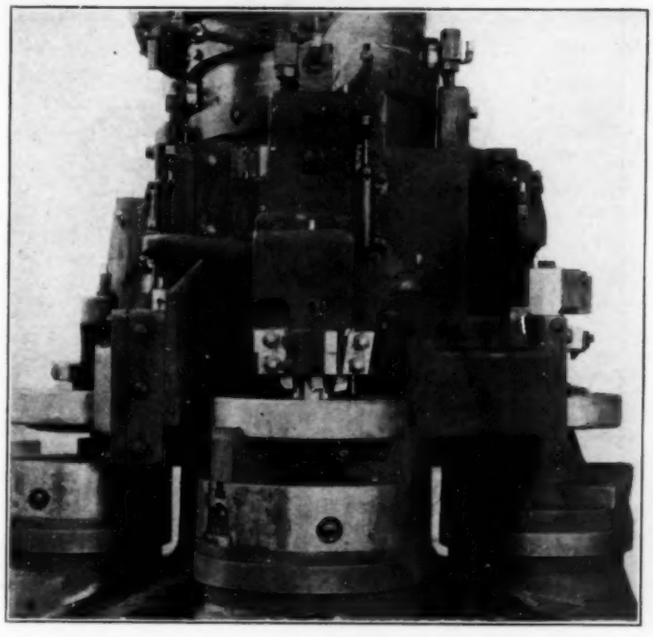
and chamfering, as in Fig. 4. The tool slide has only vertical movement, and the illustration shows the sharp drop of the cam and the large diameter of the cam roller. Fig. 5 shows the finishing operation, which resembles the first as far as the tooling is concerned. The wheel, however, is driven by a central mandrel instead of a chuck, so as to insure the rim being true with the bore. When the wheel is finished it weighs 115 lb., as about 25 lb. of metal is removed in machining.

gear is not a driver, but is merely to insure the quiet and easy meshing of the driving gear when the table reaches the point for beginning its work.

The upper gear is constantly in mesh, while the driving gear drops out of mesh with the central gear when it reaches the loading position, under control of a cam in the base. When the cam again raises the driving gear to start the table, the friction plate on its upper surface contacts the upper gear and brings the driving







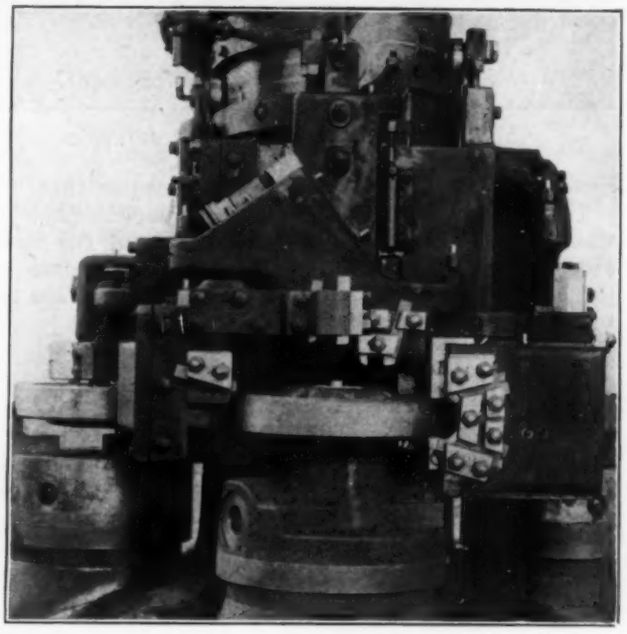


FIG. 2—FIRST CUT ON FLYWHEEL. FIG. 3—BORING AND TURNING THE INSIDE. FIG. 4—FINISH BORING. FIG. 5—FINISHING THE OUTSIDE

A view of the central column around which the carrier revolves with its work tables and tool heads is shown in Fig. 6. The power shaft is shown in the center of the column, and toward the bottom the gears which revolve the work tables. Below the gears is the bearing for the carrier. The work table spindle and its bearing, on the right of the illustration, show a detail of the construction used. The upper or narrow-faced gear up to speed before the cam throws it into mesh with the central gear. The view shows also the length and diameter of the work table spindle, with its bearing at each end. The upper bearing is 7 in. in diameter on the straight portion and 12 in. at the top of the angle.

This machine has been designed to handle work too large for the Mult-Au-Matic, and where a simple, massive machine can secure maximum production with a

minimum of training on the part of the operator. Perhaps the best idea of its simplicity may be had from the fact that it contains but 225 parts, exclusive of the chucks. The largest diameter is 68 in. and the height to the top of the oil piping is an even 10 ft. The weight is 23,500 lb. The machine is so designed that no special foundation is required. It is equipped with a 30-hp. motor, but the maximum used in turning the flywheels shown was about 7 hp. and with the machine running idle about 2 hp. The time of the complete

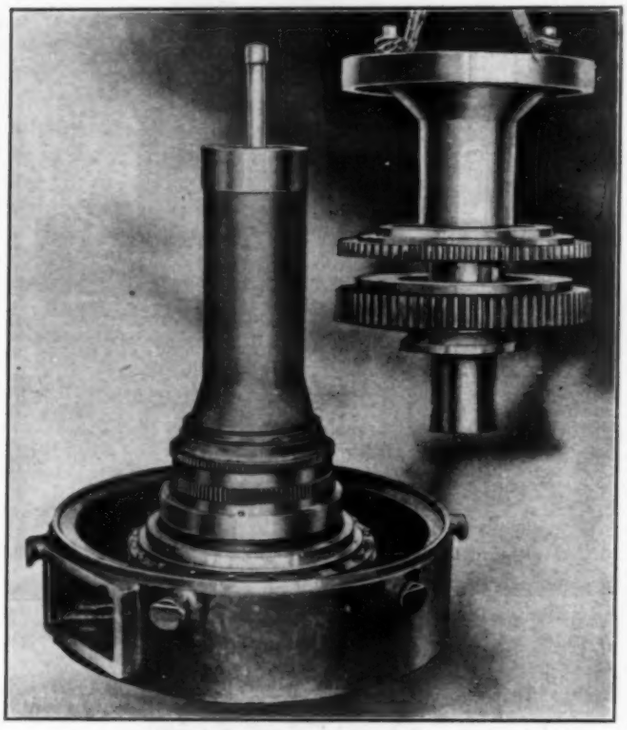


FIG. 6—COLUMN AND ONE TABLE SPINDLE

cycle was 4 min., of which 70 sec. was loading time.

The oiling system includes a very complete filter in which the oil goes first to the underside of the filter screens, so that any solid particles in the oil drop to the bottom and do not tend to clog the filter. The oil to the bearings is piped direct from the filter.

Racine Portable Duplex Bandsawing Machine

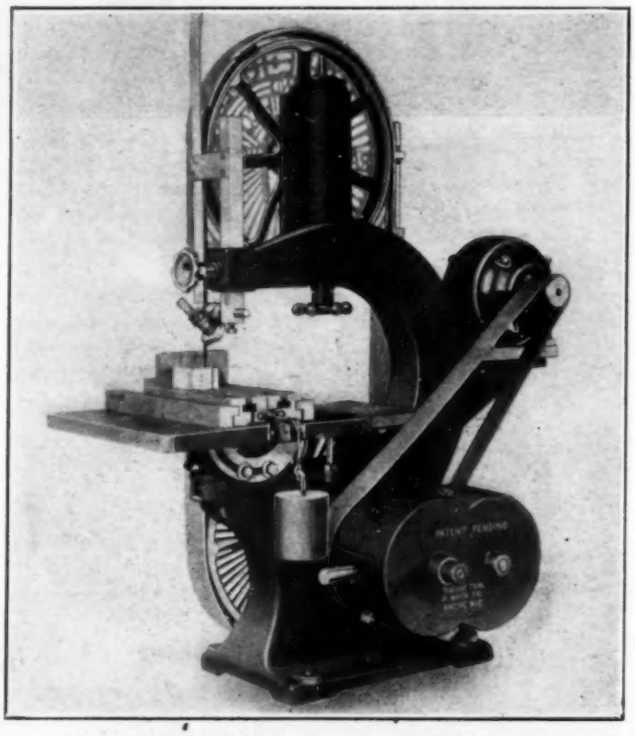
A small portable bandsawing machine of the duplex type for cutting both wood and metal has recently been placed on the market by the Racine Tool & Machine Co., Racine, Wis. The machine is suitable for use in toolrooms, pattern shops, trade schools and places in which light wood and metal cutting need be done.

The accompanying illustration shows the drive side of the machine as fitted for metal work. A ¼-hp. induction motor running at 1,750 r.p.m. furnishes the driving power. It is attached to a convenient lighting circuit by a flexible cord, a feature that adds to the portability of the machine. The platform on which the motor is bolted is an integral part of the main frame. The frame provides a capacity from the throat to the blade of 14 in. The capacity between the table and the guide is 5 in. and between the metal-cutting vise and the guide 3 inches.

The wheels carrying the saw blade are of cast aluminum 14 in. in diameter, with the rims machined and covered with rubber bands. They run on ball bearings mounted in grease-packed housings whose positions are easily adjustable. A hand screw is provided to tilt the upper wheel to properly align the blade. The tension on the blade is controlled by a hand screw operating against a spring, so as to give a cushioned tension. The spring serves as a safety device; if chips accidentally fall between the blade and the lower wheel, they will pass around the wheel without breaking the blade. The saw blades used can vary in length from 7 ft. 6 in. to 8 ft. Both the blade and the wheels are protected by aluminum guards mounted on hinges so that they can be swung out of the way to give access to the wheels when changing the blade.

The saw guide is adjustable for blades from ⅛ in. to ⅝ in. in width and of any gage. The guide wheel runs on ball bearings. The guide is mounted on a square steel post and is easily adjustable to the desired height. The table is 15x15 in. in size and 16 in. above the bench on which the saw stands. It can be tilted up to 45 deg. and clamped in any desired position.

A two-speed attachment can be provided when it is desired to use the machine for both wood and steel, the change being accomplished by the shifting of one lever. The slow speed enables cutting sheet steel and flats up to ¼ in. without the necessity of clamping in a vise. For bar stock, rounds, flats, and shapes up to 3 in.



RACINE PORTABLE BANDSAWING MACHINE

in thickness, the gravity-feed vise can be furnished. The vise is fitted with a quick-acting cam lever to aid in holding material of various shapes. It can be easily bolted to the table and removed. A pedestal 22 in. high can be furnished.

The machine has an over-all height of 39 in. and requires a floor space of 34x17 in. when plain and 34x21 in. with the two-speed attachment for metal cutting. The weight of the plain machine is 200 lb., while equipped with the vise and two-speed transmission for both wood and metal cutting it is 285 pounds.

Thomson Type SP Butt Welding Machine

The Thomson Electric Welding Co., Lynn, Mass., has recently brought out a line of butt welding machines in which appear a number of changes from the former designs, and which are especially adapted to making the so-called "flash" welds.

The platen to the left, which has heretofore been gibbed to the bed and capable of adjustment by means of a screw back-stop, is made rigidly a part of the machine frame. The movable platen is made of cast iron and is much longer in proportion to its width than heretofore, thus insuring a free moving slide.

In the smaller machines the pressure to effect the weld is applied to the movable slide by means of a hand lever and toggle joint through a right-and-left threaded pitman and adjusting nut similar to the pitmans of many punch presses. This combination provides a wide range of adjustment for position of the movable platen, and at the same time enables the operator to apply the maximum welding pressure as the toggle straightens out, thus relieving him of the necessity for severe exertion. In the larger sizes the pressure is applied by hydraulic cylinders.

Primary windings for the transformers may be supplied for any standard voltage from 110 to 550, and for frequencies of 25 and 60 cycles. A five-point regulator switch mounted on the base of the machine controls the flow of current. The secondary coils are flexible, being made up of laminated copper strips firmly clamped to the terminals. The secondary terminals themselves are heavy castings of copper, bolted to the ends of the respective platens, where they form the parts to which the work-holding fixtures are directly attached. This construction eliminates the necessity for platens of solid copper and for sliding electrical contacts.

The transformers are of the open type of ample cross-section to carry all normal currents without resistance heating, and are air cooled. The terminal castings and the platens are chambered and fitted with connections for water circulation to prevent undue heating, by radiation and conduction from the work. The work-holding clamps are of the vertical type and are ordinarily operated by hand levers. Pneumatically operated clamping devices may be furnished if desired, and the machine shown herewith is so equipped.

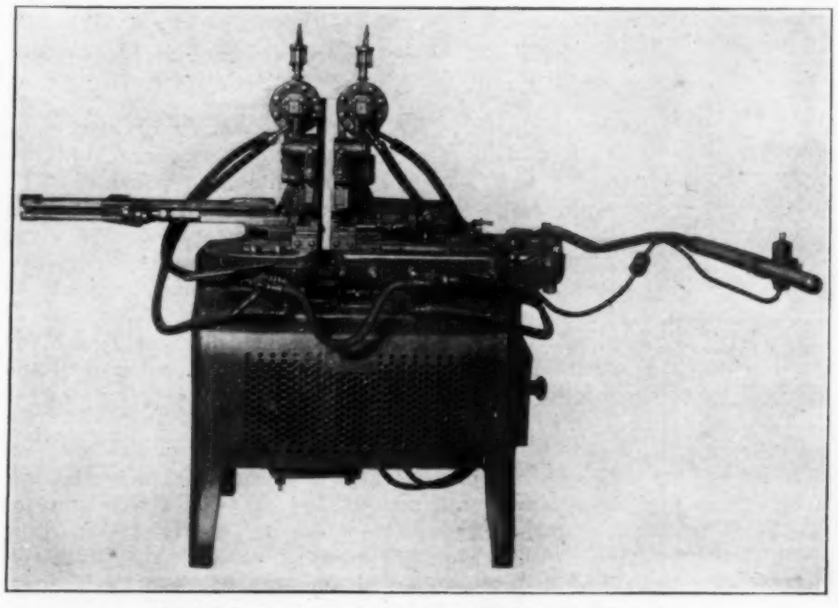
The SP machines are lighter for a given capacity than are those of the older type, yet they are stronger and show a higher electrical efficiency. They are built in five sizes, the smallest having a welding capacity ranging from a rod $\frac{3}{16}$ in. in diameter up to 1 sq.in. in cross-section, while the largest one welds work having cross-sectional areas from $\frac{1}{2}$ to 20 square inches.

Amsler "Elastic-Column" Dynamometer for Hardness Testing Machines

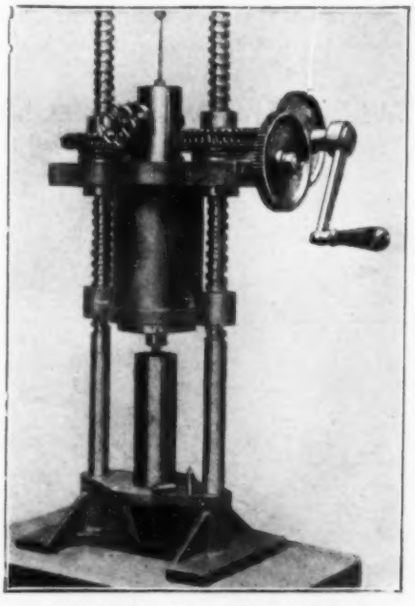
Holz & Co., Inc., 17 Madison Ave., New York, N. Y., have recently placed on the market a line of hardness testing machines employing an "elastic-column" dynamometer and made at the Amsler works in Switzerland. The elastic-column dynamometer is an apparatus employed for measuring and indicating the load exerted by machines that are not used for producing a fracture of the material under test, but rather static deformation with definite predetermined pressure. It is suitable for hardness testing by either the Brinell method, in which an impression is made in the work by means of a small ball, or by the Ludwik method, in which a cone is employed for a similar purpose.

The accompanying illustration shows a small-sized hardness testing apparatus of this sort with the elastic-column dynamometer incorporated in it. The apparatus forms the upper part of the press. The member carrying the ball or contact point is secured to a plate at the bottom of the housing. The total load acting on the test piece is then transmitted by means of several steel bars or short columns in the cylindrical housing. The reaction is born by the upper part of this housing, which is connected to the platten of the machine so as to support the work from below. The deformation of the columns due to the compressive stress is always proportional to the load that they are sustaining. Since the columns are loaded far below their elastic limit, they do not undergo permanent deformation.

In the center of the load-supporting column is another



THOMSON TYPE SP BUTT WELDING MACHINE



"ELASTIC-COLUMN" MACHINE

column that is not subjected to stress. It supports a small piston that moves in a space filled with mercury. Consequently, when the supporting columns are shortened under load, the central piston moves up in its mercury space a distance equal to the shortening of the columns, thus expelling a quantity of the mercury into the capillary tube shown on top of the housing. The quantity of mercury expelled is proportional to the load placed on the work.

A micrometer screw, the end of which is immersed in the mercury, is employed to measure the amount of mercury that has been expelled into the tube. The level of the mercury can be adjusted to any desired height by turning the screw. Thus, after load has been applied, the level of the mercury can be brought back to the point at which it stood before the load was put on, and the amount that the screw is turned may be used as a measure of the load applied. If it is desired to apply a definite load with the machine, as, say, 3,000 kilos, the micrometer screw is turned back three complete revolutions and then the load gradually increased until the level of the mercury returns to its original height. The reading of the load is thus independent of the bore of the capillary tube, so that in case of accidental breakage, the tube can be replaced without influencing the accuracy of calibration.

While the dynamometer is sensitive, it is at the same time of very rugged construction. It can be overloaded only when the testing machine itself is being wrecked. The dynamometer is calibrated by dead load up to its full capacity, and the calibration can be checked at any time by hanging the machine up by the compression plate, the load then shown agreeing with the weight of the machine.

The dynamometer can be mounted in the testing machine in different manners. In the illustration is shown a ball-type hardness testing machine having two speeds. The fast speed enables bringing the ball quickly to the required position, and the slow speed is used to apply the load. The machines are driven by hand levers and are not of the hydraulic type.

With the simple wormgear drive employed there is but little that can get out of order, or be deteriorated by the action of dust and soot such as encountered in heat-treating shops and which is apt to find its way into hydraulic valves. Mountings, both large and small, can be furnished for use on the bench or the floor.

White Motor-Driven Flexible-Shaft Outfits

Small portable motor-driven flexible-shaft outfits have recently been placed on the market by the S. S. White Dental Manufacturing Co., 211 South 12th St., Philadelphia, Pa. The $\frac{1}{15}$-hp. outfit equipped with a Type W motor is illustrated in Fig. 1. The motor is intended for 110-volts alternating or direct current,

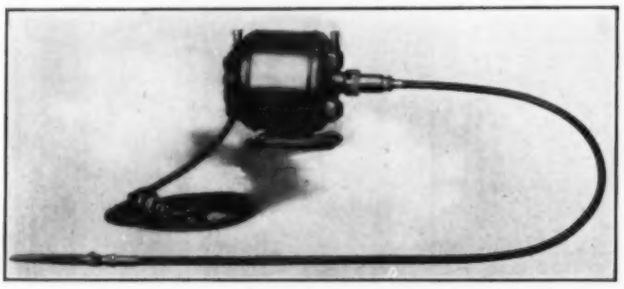


FIG. 1—WHITE TYPE W PORTABLE ELECTRIC-DRIVEN FLEXIBLE-SHAFT EQUIPMENT

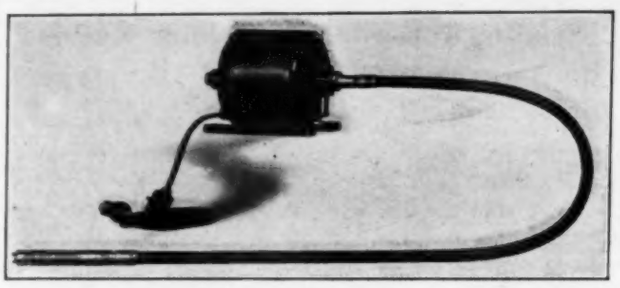


FIG. 2—WHITE TYPE Y FLEXIBLE-SHAFT OUTFIT

and runs at a speed of 3,450 r.p.m. An attachment cord and plug and a push switch are furnished. The flexible shaft is fastened directly to the motor, and carries a No. 7 handpiece.

The flexible shaft has a diameter of 0.15 in., and the casing of $\frac{3}{8}$ in. Either fabric or metallic casing can be furnished in lengths of 36 and 48 in. The flexible shaft itself consists of layers of fine wire, the direction of winding being reversed in each layer. The motor shaft is hollow at one end to receive the end of the flexible shaft, and a special construction of the bearing housing is provided to carry the casing for the flexible shaft. The tool is especially useful for work on small dies and for undercutting mica on the armatures of small electric motors. Complete equipment for all types of work can be furnished, as abrasive wheels, drills, small mills and burs are all available. The handpiece incorporates a small locking chuck by which the mandrels of the tools can be securely held.

An outfit driven by a $\frac{1}{4}$-hp. motor operating on 110-volt alternating or direct current at a speed of 1,750 r.p.m. is shown in Fig. 2. This Type Y motor is for heavier work than the Type W, and is applicable to a large variety of operations such as grinding, polishing and drilling that are required in a machine shop. The shaft of the motor is machined to receive the flat end of the flexible shaft. A screw collar holds the casing securely on the end of the housing. A connecting cord and plug having a push switch are provided.

The flexible shaft is ordinarily furnished in sizes of 0.250, 0.312 and 0.375 in., the size of the casing being $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ in., respectively. As with the smaller shaft, helical layers of spring-steel wires tightly laid in strands of three or four wires each form the shaft. The diameters of the wires in the different strands depend on the size of the shaft, and the position in the shaft. The smallest size casing is covered with fabric, consisting of a flat wire spring or helix over which is laid a series of cotton braidings that are treated with varnish, baked and then polished. The two largest casings are metallic, and are more durable although not quite as flexible as the fabric casing.

The No. 3 handpiece has two interchangeable chucks, so that drills and shanks from the smallest made to $\frac{1}{4}$ in. in diameter can be gripped. The chucks are of the three-jaw variety, and provide a rigid grip. The spindle carrying the chuck is hardened and ground and runs in a hardened ground bearing. A thrust washer of anti-friction metal is provided.

The fore part of the sheath or grip practically covers the cap nut on the chuck socket, so as to protect the thrust bearing from dirt and abrasive and permit the operator to grasp the handpiece nearer the working tool. A reservoir for oil is provided in the handpiece. The construction is such that taking down for cleaning can be easily performed. Cutting tools, wheels and similar equipment can be furnished for all types of work.

News Section

Machine Tool Builders Declare Stock Dividends

Important changes in the capitalization of three of the major plants in the machine tool industry of Cincinnati were announced last week by officers of the interested companies.

The companies involved are the R. K. Le Blond Machine Tool Company, the Cincinnati Bickford Tool Company and the Cincinnati Milling Machine Company, all of Oakley.

The Le Blond Company, according to reports, will change the charter of the company from Ohio to Delaware. The company will be dissolved to meet the legal requirements, its Ohio charter surrendered and steps taken to reincorporate under the laws of Delaware.

At the same time questions relative to an increase in capital will be decided, according to E. G. Schultz, treasurer of the company.

The reorganization of the Cincinnati Bickford Tool Company was effected yesterday through the issuance of a charter at Columbus to the Cincinnati Bickford Company, capital $2,000,000.

C. P. Gradolf, secretary of the Bickford company said that the new charter was in effect an authority to increase its capital from $500,000 to $2,000,000 for the purpose of distributing stock valued at $1,025,000.

The newly authorized issues are $1,000,000 preferred 6 per cent and $1,000,000 common. At present a total of only $1,025,000 is to be issued, according to Secretary Gradolf.

Of this, $500,000 will be issued in blocks of 6 per cent preferred at $100 par and the $525,000 common will be issued in $25 shares. The remainder of the authorized capital will be held in the treasury for further expansion.

President A. H. Tuechter said that the $500,000 preferred is to be distributed among the present shareholders.

Yale Begins Lectures on Engineering Profession

Lectures by prominent engineers are being made part of the program of development of the engineering courses in the Sheffield Scientific School of Yale University along broader university cultural lines. These lectures will deal with the engineering profession as a whole—with its history, opportunities and obligations, with its attitude toward public and private needs, its notable achievements, and kindred topics.

Special lecturers are being chosen both for their knowledge of engineering and for their experience in dealing with public problems. The first lecturer was John Hays Hammond. The second will be L. W. Wallace, executive secretary of the Federated American Engineering Societies, and a former member of the faculty of Purdue University. Mr. Wallace, who was vice-chairman of the Hoover Committee on Elimination of Waste in Industry, and who is president of the Eye Sight Conservation Council of America, will speak at Yale on December 12.

Mr. Wallace's subject will be "The Engineer in Industry." Among other things he will discuss the report of the Committee on Work-Periods in Continuous Industry of the Federated American Engineering Societies, which found that the twelve-hour day in industry was economically unnecessary. President Harding has characterized this report as representing his "social viewpoint."

Pennsylvania Road Raises Pay of 30,000

Wage increases aggregating approximately $1,800,000 annually have been granted 30,000 maintenance of way employees of the Pennsylvania Railroad system, John G. Rodgers, vice-president of the Northwestern region of the road, announced in Chicago last week.

The increases ranged from one cent an hour for carpenters, painters and masons' helpers to five cents an hour for assistant bridge and building foremen and will be retroactive to November 1.

The adjustment was reached through a series of conferences between the general managers of the four regions of the road and the Pennsylvania System Fraternity, a company organization.

The Pennsylvania refused to settle with the Federated Shopcrafts when their recent strike was terminated on some roads and instead organized its employees into a company union. The employees then elected representatives to negotiate all differences with the management.

A Triple Convention

F. D. Mitchell, secretary-treasurer of the American Supply and Machinery Manufacturers Association, with offices at 1819 Broadway, New York City, issued last week an advance announcement of a triple convention of the National Supply and Machinery Dealers Association, the Southern Supply and Machinery Dealers Association and the American Supply and Machinery Manufacturers Association.

The convention will be held in Cincinnati, Ohio, May 17, 18 and 19, 1923 with headquarters for all three associations at the Hotel Sinton.

Industrial Engineers Meet in Springfield

At the opening winter meeting of the Western New England chapter of the Society of Industrial Engineers in Springfield, Mass., the discussions related to the topic "The Planning of Work." In a paper on "Sales Forecasts" Walter F. Bachelder, secretary of George W. Prentiss & Co., wire manufacturers, Holyoke, Mass., told of the value of a systematized policy looking to a more even flow of production.

Bradstreet Price Index Shows Advance

Bradstreet's index number of average commodity prices on Dec. 1, for which the first computation was published by Dun's Review last week shows an advance of 3.3 per cent in the general average during October, as compared with an increase of only 1⅛ per cent shown by Dun. As compared with a year ago, the increase is 21.9 per cent.

From the high point of 1920, reached on Feb. 1, it shows a decrease of 33.9 per cent, as against a decrease of 29.5 per cent from the 1920 maximum shown by the Dun percentage. The December average, according to Bradstreet's, stands 58.2 per cent above that of Aug. 1, 1914. In the Dun computation, the December average stood 53⅜ per cent above that date. Food products and textiles led in the advance of Bradstreet's average, as well as Dun's.

Rail Executives Drop Labor Policy

The Association of Railway Executives last week decided to withdraw, so far as possible, from all questions dealing with labor, traffic and public relations, and to restrict the functions of the association to questions of national legislation, governmental action and policies and legal matters with a nation-wide application.

The railroad executives also decided to leave the place of the late Thomas De Witt Cuyler, former chairman of the association, unfilled and to abandon the New York office. Headquarters will be maintained in the counsel's office in Washington in the future.

Today's action marks the passing of nation-wide treatment of strikes and strike threats. Whereas the association dealt as a whole with the shopmen's strike last summer and the threatened strike a year ago, in the future each individual road or each regional executive body will act.

Members of the organization said one of the purpose of today's decision was to get the treatment of labor questions back in the hands of the individual roads. It is impossible, they said, to deal with the railroad workers of the entire country on a just or equitable basis and so long as the system of nation-wide treatment continued they declared it would be impossible to get back to economical operation of the carriers.

The affairs of the association will be vested in an executive committee to be elected annually by the association.

Chalmers Motors Sold

The Chalmers Motor Company in Detroit was purchased at a receiver's sale last week by Boyd G. Curtis, local attorney representing the Maxwell Motor Company. The sale price was $1,987,600.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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LAST week I made a hurried trip through the Middle West, stopping at Pittsburgh, Cleveland, Chicago and Minneapolis as well as some other minor points. At each place I talked with several prominent business men and sought to check off the reports of business conditions received in New York which are not always reliable because they cannot reflect the feeling and temper of the distant communities upon whose confidence in the future and contentment with the present our prosperity is largely dependent.

Summarizing my impression it may be said that those who deal with city people are reasonably busy and expect a good trade through the winter, but that the others whose business is chiefly with the agricultural or rural districts are not optimistic. The latter class say that while the farmer has lately been buying a little more freely he is still heavily in debt and that his purchases have been and will be confined to the things that he cannot do without. As attesting the correctness of this view I had my attention called to the number of small banks that have recently failed including one each at Omaha, Nebraska, Sterling, Colorado, Huntley, Montana, and Andale, Kansas, whose suspension was reported on the 4th of December.

These conditions are generally attributed to the disparity between the price of what the farmer has to sell and the things he must buy and this disparity is in turn chiefly ascribed to the high freight rates and the inability of the railroads to handle the tarffic offered.

In Minneapolis it was asserted that the entire potato crop of the Minnesota Valley, said to be worth many millions, was rotting on the farms because cars to carry it could not be had and the proprietor of an important factory in a Wisconsin town told me that he was having all his raw material and output shipped by express because the freight service was so slow. He added that the interest he saved on the capital tied up more than paid the increased cost of transportation.

The railroads realize their predicament. President Markham of the Illinois Central and President Storey of the Santa Fe are both publishing paid advertisements explaining that their hands are tied by over-regulation; but their explanations do not move the traffic and in their blind indignation the people are writing their representatives in Congress demanding that the Government shall "do something" though there is no general agreement as to what this "something" shall be.

Another cause of discontent is the stampede to declare stock dividends that is reported in the papers. As I sat in the smoking car on my way from Cleveland to Springfield, Ohio, I heard two men commenting upon the headlines over an announcement that the Atlantic Refining Company had declared a stock dividend of "900 per cent." One of them appeared to be a country doctor. The other said he was a farmer. Their language is hardly printable but they were agreed that Wall Street was a den of thieves who controlled the capital of the country and used their power to rob the defenseless and evade taxation.

These observations are recorded not only because they account for the so-called radicalism in Congress but because they connote a discontent that is, I fear, incompatible with the "good times" whose arrival or approach so many are now loudly heralding.

But insofar as concrete fact can be differentiated from the no less important factor of feeling or sentiment, it is to be admitted that they are encouraging.

Cotton, wool and the fabricated articles into whose manufacture these and other staples enter are in fair demand at prices which are satisfactory though they seem to have stopped advancing.

Money is slightly easier at 4½ per-cent for the very best commercial paper and the Federal Reserve statement seems to indicate a continued abundance of credit despite a reduction of 2.1 per cent in the Federal Reserve ratio which reflects a decrease of $27,000,000 in the gold held due chiefly to the effort made to put "yellow backs" into circulation.

Sterling exchange has advanced to 4.56¼ which is the highest price touched since July, 1919, when the British Government pulled the war "peg" out. This ought to facilitate our trade with that large portion of the world which still measures values in pounds, shillings and pence.

There is no speculation in either securities or merchandise, no one is overstocked and away from the few large cities where wealth displays itself, there is little or no extravagance.

There is a job at good wages for everyone who is willing to work and there is but little idleness.

Wealth, which has been aptly described as "canned labor," must therefore be increasing and the problem of the statesman and the economist is to induce its productive employment. That a solution for this problem cannot and will not soon be found is unbelievable, but the doctors have not yet agreed upon the remedy that should be applied. Secretary Mellon advises a reduction in the super-taxes so that private capital will not be driven into tax-exempt bonds whose proceeds are often wastefully employed.

It is doubtful whether Mr. Mellon's proposal is politically practicable with Congress and the people in their present temper but there is much to recommend his suggestion for the weakness of the stock market is largely due to the hysterical eagerness of large capitalists to convert their taxable stocks and bonds into tax-exempt securities. In the case of the railway shares the declining tendency has been accentuated by the fear that the Farm Bloc or the Progressive Bloc or some other Bloc will succeed in securing a reduction in railway rates that will be ruinous because a correlative reduction in wages will not be permitted.

Judging from what was said in the West this is unlikely. The people realize that the railroads cannot function if they are bankrupt and in many quarters the idea of subsidizing them as well as the ships seems to be gaining in favor. The theory is that the cost of transportation is, in the last analysis, a tax upon the whole people which would be more equitably distributed if it were assessed as a tax which everyone would pay instead of being collected from the few in the form of freight charges.

For these reasons and because it is generally wise to buy when most people are alarmed and selling, I continue to believe that the stock and bond markets will now repay the bargain hunter. None of us really think the United States is going to economic perdition, failing which many securities are certain to be worth more than current prices when the present depression has passed.

But of commodities it would not be good judgment to generalize so indiscriminately. None of the staples are any longer subnormally cheap. Even sugar and rubber have passed out of this category. And as for manufactured articles they cannot be advanced much more without raising the cost of living to a level that may provoke an outcry and a buyers' strike.

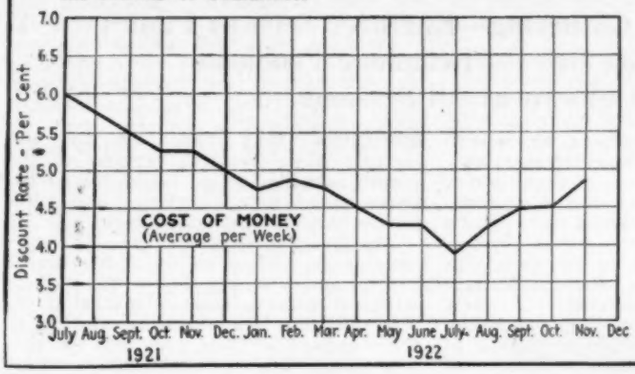
Conservatism and caution on the part of merchants and manufacturers would therefore seem to be advisable, especially as the inflationary power of our redundant money supply seems to have spent itself. This is perhaps explained by the continued disbursement of gold certificates by the banks and the amount of our Federal Reserve currency in circulation in Europe where according to reliable reports it is becoming the preferred medium of exchange in the retail trade of the Continent.

Exports of Steel and Iron Increase

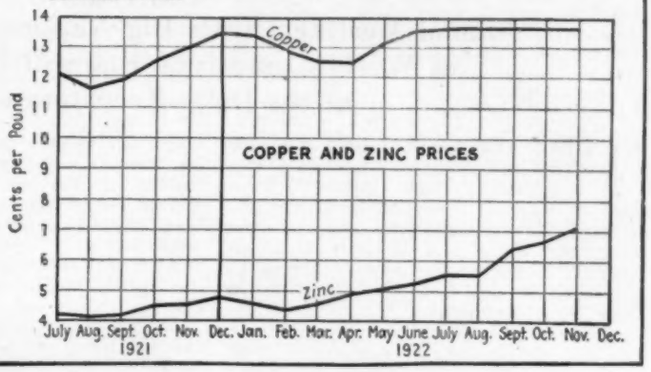
Exports of iron and steel, after declining steadily since June, increased 3,367 tons in October.

According to the official compilation of the Department of Commerce, made public yesterday, the total tonnage shipped abroad during the month was 134,095. This compares with 130,728 tons in September.

Average weekly rates for 60 and 90 day commercial paper based on daily New York quotations furnished by the Journal of Commerce.


Discount Rate - Per Cent
COST OF MONEY
(Average per Week)
July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec
1921
1922

Average of New York weekly quotations on electrolytic copper and zinc as reported by Engineering and Mining Journal-Press.


Cents per Pound
Copper
COPPER AND ZINC PRICES
Zinc
July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1921
1922

COST of money as reported from the various points in the Federal Reserve System shows a firmer and higher tendency. City and country banks have been in the market for prime commercial paper and an excellent demand has been in evidence with fairly liberal offerings. The range in rates during November was definitely between 4¾ and 5 per cent as compared with an approximate range of 4½ to 4¾ per cent in the month previous.

Equipment shares fell off again during November, the average price of ten representative issues dropping from $106.50 to $100.30, thus showing a full ten-point decline from the high average mark of September. Profit taking has been in evidence to a large extent with the general public manifesting little interest in the market. Declarations of huge stock dividends on the part of many companies is also mentioned as a factor in causing the depression.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0295	$0.0295	$0.0273
Cold finished shafting.....	per lb.....	0.0378	0.0378	0.0373
Brass rods.....	per lb.....	0.171	0.1700	0.15
Solder (½ and ½)	per lb.....	0.24	0.23	0.20
Cotton waste..	per lb.....	0.11	0.11	0.122
Washers, cast iron (¼ in.)...	per 100 lb.	4.33	4.33	4.33
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	3.11	3.11	.....
Lard cutting oil	per gal.....	0.59	0.575	.....
Machine oil....	per gal.....	0.36	0.36	.....
Belting, leather, medium.....	off list.....	30–10% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list.....	55% @60%	50%@ 65–10%	50%@ 60–10%

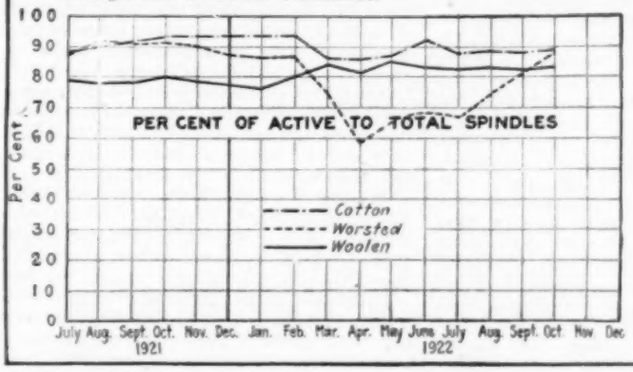
Copper and zinc prices, on the average, show but fractional changes during November. The average price on the New York market for the former was 13.598 cents as against 13.632 cents in the month previous. Zinc averaged 7.104 cents as against 6.840 cents in October. Export business in copper continues fair with France and Italy as the principal buyers. In the domestic market there has been a fair volume of business with producers optimistic as to prospects for 1923. The zinc market shows improvement with good support as a result of European buying, and increased domestic demand.

Textile industrial activity in the United States during the month of November compares favorably with the month previous. Cotton spindleage in operation amounted to 85.4 per cent of the total in place as compared with 84.4 per cent in October. In the woolen industry the activity has been nearly the same as in the previous month, November showing 90.8 per cent as against October with 90.6 per cent. Worsted conditions continue to improve, active machinery amounting to 89.1 per cent as against 81.4 per cent in October. The demand for woolens and worsteds continues steady, and cotton yarn prices are strong. Exports of cotton goods continue in good volume.

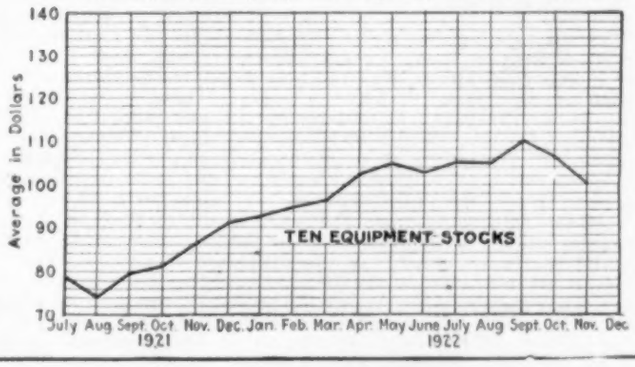
Railroad earnings of American railroads, according to the final report for 189 out of 192 roads of Class 1, showed a net operating income for October of $85,234,000, which represents a return on an annual basis of 4.05 per cent on the tentative property valuation. This compares with a net of $105,425,600 for October, 1921.

Commercial failures in the United States in November, according to reports furnished by Bradstreets, numbered 1758, an increase of 9.8 per cent over the total reported for October and the largest in any month since May. Liabilities totaled 54 millions, 46 per cent above those of October.

Monthly percentage of active cotton, woolen and worsted spindles to the total in place as reported by the Bureau of Foreign and Domestic Commerce.


Per Cent
PER CENT OF ACTIVE TO TOTAL SPINDLES
Cotton
Worsted
Woolen
July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec
1921
1922

Monthly average: Am. Brake Shoe; Am. Car and Fdy.; Am. Loco.; Baldwin; Lima Loco.; N. Y. Airbrake; Pressed Steel Car; Pullman; Ry. Steel Spring; West'h'se A'Brake.


Average in Dollars
TEN EQUIPMENT STOCKS
July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1921
1922

Mechanical Engineers Discuss Live Problems

Annual Meeting Draws Big National Gathering—Engineer Seen as Pilot of World's Industry—Eminent Men Discuss Economic Problems of the Day—Keen Interest Shown at All Sessions

THAT America is in need of a new type of industrial leadership was asserted by Dean Dexter S. Kimball of Cornell University in his address as retiring president of the American Society of Mechanical Engineers at its annual convention held at the Engineering Societies Building in New York last week.

"Unless we can in some manner change our industrial system so that we can more nearly attain universal well-being and distribute the fruits of our industry more equitably," said Dean Kimball, "we have no reason for believing that our civilization shall endure, and its bones will full surely strew the shores of time with those of the great civilizations that have preceded us."

The features that characterize our present civilization and distinguish it from those that have gone before it were stated to be: (a) Production in agriculture and that in industry are entirely separated, (b) the problem of transportation is added, (c) the worker is separated from ownership of the tools of industry, and (d) division of labor is carried to a high degree.

The engineer is destined to be a powerful factor in modern industry, according to Dean Kimball, because "modern civilization is largely what the engineer has made it, and the civilization of the future will be largely what he wishes it to be." Dean Kimball expressed his unswerving faith in the ability of the engineer always to feed, clothe and house the human race.

Such men as Secretary Herbert Hoover and Governor Hartness of Vermont he characterized as pioneer adventurers in a field hitherto considered the exclusive territory of the lawyer and the politician. "They are," he said, "undoubtedly the vanguard of a larger invading army." Military rule in government is disappearing and legal rule will be modified by new industrial conditions, continued Dean Kimball, who saw in the engineer a new pilot of the world's industrial machine.

Dean Kimball's address marked the evening session of the opening day, Monday, Dec. 4, the morning having been given over to registration of delegates, conferences and council meetings.

Management Session

The outstanding feature of the Management Session, held Tuesday morning in the Auditorium, was the presentation by title of L. P. Alford's paper, Ten Years' Progress in Management. The paper was presented by title only because of its previous presentation and discussion in many cities during Management Week, Oct. 16-21, 1922.

Among the more important points brought out in the discussion was the feeling that management in the future must come more from the bottom up than from the top down, as in the past, and that greater importance must attach to foremen training. It seemed to be the general sentiment that a better knowledge of economics on the part of major and minor executives was a crying need. In the interests of standardization it was suggested that better definitions of management and its functions should be determined upon in the near future.

An excellent paper on Relieving Industry of Burden was read by Wallace Clark, industrial engineer, of New York. Progress reports were offered by the committees on Standardization of Terminology and Standardization of Graphics by the chairmen, F. E. Town and J. J. Swan.

Machine Shop Session

The Machine Shop Session was presided over by F. O. Hoagland, the first paper being that of Forrest E. Cardullo, Chief Engineer of the G. A. Gray Co., on "A New System of Helical Involute Gearing for Use on Metal Planers." The paper gives six characteristics which are necessary to give satisfactory service, as follows:

"The gears must give smooth and uniform motion without impacts, vibration or chatter. If they do not do so, variation in the driving force, or in the speed of driving, will be transmitted to the table, causing it to vibrate and produce chatter marks on the work.

"When the gears wear, they must preserve their correct tooth form, so that they will continue to give smooth and uniform motion without chatter.

"It is necessary that the gearing have ample strength, so that it will transmit the maximum force which can be applied by the source of power, without reaching the elastic limit of the tooth material.

"The several gears must have such tooth forms and widths of face that they will run for a reasonable length of time without serious wear.

"Should there be wear of the bearings and shafts which would permit the gear centers to separate by a measurable amount, the tooth forms must be such that gears will still give smooth and uniform motion.

"The tooth forms must be such that the teeth can be correctly produced by an efficient and economical machining process."

Mr. Cardullo then pointed out some of the problems and experiences encountered in designing the new gearing, among these being the objection to the herring bone gears on account of the practical difficulty of obtaining two helical gears of opposite hand, but of exactly equal helical angle, pitch, diameter and pressure angle. Variation in any of these quantities, in the two halves of either gear, or in the pinion, results in an unsatisfactory and jumpy action. It was, therefore, decided to use helical gears, and to give the bull gear a right-hand helix, which would tend to draw the table toward the operating side of the machine. This is counteracted by the feeding pressure of the tools in at least 90 per cent of the work done on a planer. Since this feeding pressure amounts, with the usual form of tool, to about one-tenth of the cutting pressure, the helix angle of 5 deg. and 40 min. was fixed upon as best for the bull gear and pinion. The remaining gears of the train have a helical angle of about 12 deg., these being so arranged that the end thrust is distributed between bull pinion, intermediate and pulley shafts. Bronze thrust washers provided with oil by a system of forced lubrication take care of the end thrusts. The frequent reversal of the planer insures the oil being forced between the bearing surfaces and eliminates the lubrication problem.

The Gray tooth has a 14½ deg. pressure angle with a pinion addendum of $3/2\ p$, and a pinion dedundum of $\frac{1}{2}\ p$, where p is the normal diametral pitch. The pitch circle is the same as that of the standard involute gear, but the outside diameter is considerably larger in the case of the Gyra, and the tooth is also considerably wider at the base.

Gear chatter is said to be caused by periodic variation in the amount and direction of the tooth pressure. Such variations, when finally transmitted to the table rack, have two components, one in the direction of motion and the other in a vertical direction. The first of these components is harmless, the second produces vertical movement of the table and work. A low-pressure angle between bull gear and table rack tends to eliminate this vertical vibration.

This paper provoked considerable discussion from representatives of the Whitcomb-Blaisdell Co., the Acme Machine Tool Co., the Pratt & Whitney Co., and the Westinghouse Electric Co. The Whitcomb-Blaisdell Co. has also used helical gears for planer drive, and has offset the thrust by changing the angle of the ways from 45 deg. each side of the center to 40 deg. on the thrust side, and 50 deg. on the other.

New Method on Bevel Gears

Under the heading of "Spherical Gears," Charles H. Logue, of the Brown-Lipe-Chapin Co., presented a somewhat novel method of studying bevel gears, by considering their pitch surfaces as being parts of a sphere. By acquiring this point of view, not only are the elementary features of bevel gear design brought out and applied to spur gears, but also the real connection between the two types is shown. This is considered essential to a complete understanding of either type. The author endeavored to point out the necessity for a difference in the design of the teeth, which has not been previously considered, and to present the entire matter in as simple a way as possible.

"Testing Involute Spur Gears"—by M. Estabrook, of the Niles-Bement-Pond Co., first showed the usual methods of testing gears, and then gave details of the Saurer gear testing machine, which records defects in spacing, pitch, tooth curve and eccentricity. The main difference between this device and those generally used is that this not only shows when a gear is defective, but shows what is wrong with it.

Walter Ferris, of the Oilgear Company, presented a paper which described very completely the hydraulic transmission variable speed device of the Oilgear Company, which has already been illustrated in our columns. The results obtained in practice indicate that this method opens a field in which great improvements in machine tool design may be made.

The last paper of the session was on "Power Required for Cutting Metal"—by Fred A. Parsons, Chief Engineer of the Kempsmith Milling Machine Co. This paper gave the result of an investigation extending over a period of more than ten years. The purpose of this investigation was to determine the fundamental laws governing milling, turning, planing and drilling operations on the various metals and alloys used in machine construction. In addition to a very large number of tests made on milling machines constructed by the Kempsmith Co., those reported by Frederick W. Taylor and Professors Bird and Fairfield in previous volumes of the society's transactions have been carefully analyzed, and the following variables studied:

1. The efficiency of the machine.
2. The rate of metal removed in cubic inches per minute.
3. The average thickness of chip before distortion.
4. The front rate on the cutting blade.
5. The material being cut.
6. Spiral angle or shear on the cutting blade.
7. The condition of the cutting tool as to its being sharp or dull.

The meeting of the machine shop section was well attended, and interest was maintained throughout the session.

Education and Training for the Industries

That division of the Tuesday afternoon session devoted to the report of the Committee on Education and Training for the Industries was well attended and of absorbing interest. It showed that many good minds are constantly engaged in the work of planning ahead for the good of industry along educational lines. W. W. Nichols, chairman, read the report of the committee. Three other reports were given, namely, Extension and Correspondence Schools, James A. Moyer; Industrial Education as Represented in Schools, C. R. Richards, and Schools for Apprentices and Shop Training, R. L. Sackett.

Mr. Moyer's report on Extension and Correspondence Schools stated that nearly every state has a correspondence school system supported by taxation. It outlined briefly the usual type of course. In enumerating the advantages of correspondence and extension courses Mr. Moyer said that the student quickly came to recognize that correspondence study has its own peculiar advantages; that it is available to him at any place and at any time; that each paper he submits gets the individual and undivided attention of an instructor; that bluffing is out of the question—he must prepare himself on every part of the lesson; and finally that he must set his own pace unhurried by more brilliant students and unhampered by sluggards. He stated further a result of correspondence courses and university extension classes is the unexpected spirit of democracy to which they have risen, explaining that social groups which ordinarily acknowledge no common interests have learned to know of each other through the common interest in correspondence lessons; and that those brought together in classes, having profited by the same instruction, have been lead through class discussion to discuss their views with the utmost cordiality and freedom.

The report gave some details of results accomplished in the extension courses of universities in Massachusetts and Wisconsin and concluded with a summary of university extension service in various institutions.

Economic Session

Prof. Wesley C. Mitchell of Columbia University and director of the National Bureau of Economic Research, was the first speaker at a joint meeting of the American Society of Mechanical Engineers and the American Economic Association held on Wednesday evening. He spoke largely on the relation between the three views that may be taken of the purpose of production: Subjectively, to fill needs; industrially to make goods; and economically, to

JOHN LYLE HARRINGTON
President, A.S.M.E.

make money. The idea was advanced that probably profit making was of the first concern, as it enabled the further building of our economic system and the promotion of the general welfare of all in the community.

Substitution of "the rule of reason and intelligence" for force in an effort to restore in America "the freedom of the individual, be he employer or employee," was urged by E. M. Herr, president of the Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., who spoke on the "Human Problem in Industry." In developing his subject, Mr. Herr went back into ancient history and told of some interesting conditions and legislation.

Mr. Herr advocated a change in the immigration laws, saying: "With industry dependent to such a large extent upon foreign-born workers, the recent immigration laws threaten for lack of common labor, the return to and maintenance of normal production. It is to be hoped that these laws will be made reasonably liberal and that restrictions will be based on fitness instead of as at present without regard to the immigrant's character or qualification to become an American citizen."

Discussion of the subjects covered by Prof. Mitchell and Mr. Herr was presented by Dean Kimball; H. R. Seager, president of the American Economic Association; John L. Harrington, president-elect of the A.S.M.E.; Ernest F. Du Brul, manager of the National Machine Tool Builders' Association; and Fred J. Miller, past president of the A.S.M.E.

The remarks of Mr. Du Brul which were particularly well received, dealt with the necessity of "selling" economics to the business man, just as has been done with other sciences. Business men are not aware of the good that economic science can do for our conditions, and they are none too well impressed with the more radical type of economic theories that frequently gain hold on the popular mind. Sound economics properly applied, stated Mr. Du Brul, can certainly build a more stable business structure.

Safety Engineering Session

In discussing the Development of Safety Codes, M. G. Lloyd of the Safety Code Correlating Committee, pointed out the need for Federal rather than state laws and codes, so that the manufacturers of machines would know what was required in the way of protection and not have to make changes according to the state into which the machine was going. He pointed out that the average deaths from accident in this country was 76,000 or as many as were lost by the American army in the world war. Of these 12,500 are industrial accidents. This number is decreasing as safety work progresses.

This was followed by a paper by A. D. Risteen on Safety Engineering in Connection with the Compression of Gases, dealing with the safe handling of oxygen, acetylene carbon dioxide, ammonia, chlorine, argon, nitrogen and air.

G. E. Sanford showed a number of lantern slides of good and bad mountings for abrasive wheels as well as diagrams showing the proper kind of flanges.

Thursday, Dec. 7 was given over to simultaneous sessions of the Power, Safety Engineering, Standardization, Ordnance, Aeronautic and Forest Products Divisions.

Aeronautic Session

While four papers were scheduled for presentation at this session, the one on night flying was not available. Archibald Black, who was in charge of the design of the experimental plane in which the first Liberty engine was installed, gave a very complete paper on the Influence of Design on Cost of Operating Airplanes. This gave a great amount of data from various sources, in an endeavor to clear up much prevalent misunderstanding. Diagrams were given showing curves of operating cost for varying duration and speed of flight, reserve horse power, etc. Air Mail Service costs were used as a basis although operators of commercial lines in both this country and England, consider them much too high. These show that planes designed for commercial use and fully loaded, can be operated at a total cost of from 0.030 to 0.032 cents per pound mile or 6.5 cents per passenger mile, exclusive of the cost of obtaining the business. He shows very clearly that, as in so many other businesses, the cost of selling is more than the cost of production. He sums up his studies as follows: The designed duration of flight should not exceed the minimum necessary to complete scheduled trips safely in a head wind and that, for the types considered, should not in any case, exceed four hours. That the factor of safety should be kept to the minimum consistent with the conditions and should in no case exceed six. That high speeds beyond those accompanying the necessary re-

serve power are undesirable and, for the types considered, should not exceed 105 to 110 m.p.h. at 5,000 ft. That climbing speed should be only sufficient to provide a reasonable margin of safety for emergencies, an initial rate of climb of 400 to 500 ft. per min. from the field being the proposed standard. That reserve horse power be kept down to that necessary for required climbing speed. That flying on one of two engines in a plane is impracticable because of prohibitive cost. That flying on two of three engines is reasonable and practicable. That initial rate of climb instead of reserve horse power or speed range should be the measure of safety. That the moderate sized machine is most efficient at present and for the type considered this is from 500 to 600 sq. ft. in wing area.

Ralph H. Upson showed that for the lighter than air machines the non-stop routes should be longer than for planes, 500 miles or more, that the load should be at least 200 passengers or 50 tons of goods per trip, made up of passengers whose time is worth at least $6,000 per year or goods worth $2 per ton hour. Although the New York-Chicago route is the worst possible from a weather standpoint, Mr. Upson believes that a nightly, 12 hour service can be maintained 100 per cent on time for six months of the year, this would however be cut to 93 per cent for the whole year.

Air Navigation, by the late Prof. R. W. Willson and M. D. Hershey was presented by the latter. This pointed out the problems of navigation in long air flights and in cases where the ground is not clearly visible. This in common with the other papers, evoked considerable discussion. A resolution was passed urging the adoption of Federal laws governing inspection and licensing of both aircraft and pilots.

Power Session

The Power division's session was presided over by J. H. Lawrence at which the following papers were read: Tests of a Type W Stirling Boiler at the Connors Creek Power House of the Detroit Edison Company, by Paul W. Thompson; Feed Heating for High Thermal Efficiency, by Linn Helander; High-Temperature and High-Pressure Steam Lines, by B. N. Broido; The Elasticity of Pipe Bends, by Sabin Crocker and S. S. Sanford; and, The Commercial Economy of High Pressure and High Superheat in the Central Station, by Geo. A. Orrok and W. S. Morrison.

Standardization Session

The Standardization Session under the auspices of the Standardization Committee with the American Engineering Standards Committee co-operating, was held Thursday morning with Col. E. C. Peck of the Cleveland Twist Drill Company in the chair. Two papers were presented. The first one was A Program of Standardization of Paper and Printing Machinery, by Wm. J. Eynon. This was contributed by the committee on printing machinery. It was brought out that standardization of machinery and machine parts must be postponed until standardization of paper sizes, styles and composition has progressed further than it has at the present time. Encouraging progress has been made in a few instances, notably by the American Writing Paper Company, but there is still much to be done.

The second paper was one of the most interesting of the session, from our point of view, and attracted some lively discussion. The title was Size Standardization by Preferred Numbers and the joint authors were C. F. Hirshfeld and C. H. Berry, both of the Detroit Edison Company. We have seldom heard a paper presented in better form at an A.S.M.E. session. Perhaps an oversight on the part of the authors had something to do with this. They forgot to bring their slides and as a result the members present had to follow the remarks of the speaker from illustration to illustration. The authors disclaimed any attempt to urge the use of preferred numbers on any industry but they did prove quite conclusively that the subject is one of sufficient interest to merit the careful attention of engineers and manufacturers all over the world. It was brought out in the paper and in the discussion that the Germans have gone far in this branch of standardization although some of the members present seemed to feel that some of the things done in Germany were of doubtful value.

The Ordnance session, with W. H. Marshall presiding heard the following papers: Machining and Lapping Very Deep Holes, by J. B. Rose; and Methods Used in Manufacture of Gun Recoil Mechanism, by R. A. Vail. A feature of the session was the showing of a series of motion pictures illustrating recent developments of mobile ordnance.

An interesting feature of the week's program was the numerous excursions arranged for the benefit of the visiting delegates. On Tuesday the plant of the Wheeler Condenser and Engineering Co., Carteret, N. J., was visited and an inspection of the new Hell Gate power station was held. The Christie Amphibian Gun Mount or Tank gave an exhibition in the Hudson River and attracted great interest.

The visit of the delegates to the McGraw Hill publishing plant at 36th St. and 10th Ave., and an inspection trip of the U. S. S. Maryland at Brooklyn Navy Yard were the features arranged for Thursday.

Social events arranged for the entertainment of the delegates during the session included a smoker, a dinner dance and various excursions for the benefit of the ladies visiting the meetings. Friday evening was set aside for reunions of the alumni of the various technical colleges and dinners were held by the following: Cornell University, University of Kentucky, Princeton University, Purdue University, Worcester Polytechnic Institute and the Massachusetts Institute of Technology.

Officers elected by the society for 1923 were as follows: President, John Lyle Harrington of Harrington, Howard and Ash.

Vice-presidents for two years: William H. Kenerson, professor of Mechanical Engineering, Brown University; Walter S. Finlay, Jr., vice-president of American Water Works and Electric Co.; Earl F. Scott, president of Earl F. Scott & Co., Inc.

Vice-president for one year: Henry H. Vaughan, consulting engineer.

Managers for three years: A. G. Christie, professor of mehcanical engineering, Johns Hopkins University; James H. Herron, president of James H. Herron Co., and Roy V. Wright, editor of *Railway Mechanical Engineer*.

William H. Wiley, and Calvin Rice, treasurer and secretary of the society respectively, were re-elected for the ensuing year.

Making Cast Iron Pipe

"Making Cast Iron Pipe" is the title of a new industrial motion picture shown at the Power and Mechanical Engineering Exposition and elsewhere in New York City this week. The film was made by the Pathéscope Film Service for the United States Cast Iron Pipe & Foundry Co., of Burlington, N. J. It shows the process of casting pipe in sand molds as well as centrifugally.

The centrifugal process of casting pipe was invented by D. S. De Lavaud, a Brazilian engineer, but has been perfected commercially in the United States by the United States Cast Iron Pipe & Foundry Co., which controls the right to its use in this country.

Casting is done in a machine that consists of a permanent, water-cooled mold, traversed longitudinally and rotated, and a pouring device. The only set up necessary is the insertion of a core to form the inside of the bell and to act as a stop for the molten iron.

Pouring is done from a tilting ladle, controlled hydraulically. The iron is discharged into a water-cooled, cantilevered trough, that reaches to the farther, or bell, end of the mold. As the iron runs in, the mold is traversed longitudinally until the pipe is completed. Speeds of traverse and rotation control the thickness of the pipe wall.

Cooling begins as soon as the first iron touches the mold and by the time the pouring is completed the bell end is cool enough to allow the application of a holding device preparatory to withdrawal of the pipe from the mold. As soon as withdrawn the pipe is carried to the annealing furnace. After annealing it is dipped in hot tar, the last operation in its manufacture.

Comparison with the method of casting in sand molds shows that the De Lavaud method requires less equipment and labor beside reducing the time necessary for making pipe from one or two days to a matter of hours, both including cupola work. The actual casting time is very short indeed, because of the necessity of working while the iron is hot. Heat is conserved because the newly cast pipe is taken directly to the annealing furnace. In the same way the tar bath is used after annealing, without reheating. Practically no core making equipment is necessary. It has been found that the centrifugally cast pipe is of very good quality as concerns grain, freedom from blow holes and impurities. It is said to possess greater strength than sand cast pipe, and to offer no difficulties to machining.

Increases Trade Funds $400,000

Appropriations for the Bureau of Foreign and Domestic Commerce are reported to have been reduced by nearly $200,000 below the estimates of the Budget Bureau by a sub-committee of the House Appropriations Committee.

Notwithstanding this $200,000 cut, however, it is the understanding that the total for this bureau will represent an increase of nearly $400,000 over the amount appropriated for the current year. Officials of the bureau are said to be fairly well satisfied with the result as the increase in appropriation will enable the department to carry out many needed improvements in its service to manufacturers.

Business Conditions in Germany

Standard of Efficiency Below Pre-War Level—Industry Burdened by Excess Employment—Machine Tool Industry at Low Ebb

By OUR BERLIN CORRESPONDENT

THE optimists of the business world, who maintained the theory, that the beginning of a business depression, noticeable since September, was a transitory character only and would soon give way to renewed booming under the spur of the money depreciation, have so far been disappointed. The record low point of the mark exchange has, as far as can be recognized, failed to exercise any stimulating influence on the market, rather the contrary is the case. The decline is becoming more and more marked and finding expression already in a gradual rise of unemployment, as is evident from the labor statistics of the National Labor Ministry.

Low Standard of Efficiency

It is a fact that the standard of efficiency, which had greatly improved at one time and ran up to almost 80 per cent has again sunk considerably below this level. Thyssen, the well-known German industrial leader, has lately, in a memorable letter to the Chancellor of State, estimated the present level at 60 per cent. This, evidently, is from observations in his own extremely well organized works. In others, where conditions differ, it is even less. The Rheinische Stahlwerke for instance, one of Germany's largest steel companies, has, in its annual report just issued, stated the standard of efficiency to be 50 per cent. The output of steel per head in this work was, in the last pre-war year, 112,500 tons and is now only 57,000 tons. The report places emphasis on the fact that even the present standard is only maintained by virtue of the costly new equipment and modern labor-saving machines, which have been put in since that time.

The outcry for an increase of production has been heard for a long time. The struggle to this end has up to date chiefly been fought in words, advices and exhortations. Having failed to produce any effect the clamor is now for more active measures, chief among them being the abolishment of the restriction of working time to 8 hours per day. The campaign to this effect is outlining itself quite clearly. It takes its main argument from the coal situation, where the enormously grown imports, chiefly of British coal, are putting the handicaps of production, produced by the so-called revolutionary achievements of the labor class, into glaring relief. The German coal production has gradually declined during recent months. Against an increase of 35 per cent of the mines' complement of workmen, stands a decline of 20 per cent in production.

The fact is, that most enterprises are overstocked with employees. This is particularly pronounced in the case of public works but also applies to private ones. Nothing short of dire necessity can produce the energy required for the process of elimination. Industrial leaders are of opinion that the time of this process has now come, believing evidently that a period of depression will be most opportune. A fight between them and the Government, which is reluctant for political reasons, is being waged deep under the surface.

From the official reports of the National Labor Ministry and of the Chambers of Commerce, the present situation of the machine building industry is the following: The reverse of business, such as has taken place, is most strongly pronounced in the western part of the country, Rhineland and Westphalia, and in the extreme east, Upper Silesia. The various groups of the machine building industry are as yet effected in a different degree. The lines working for transportation, like locomotives, railway car manufacturing and shipbuilding, appear to be in the front rank. In the locomotive industry, it is the decline of foreign orders, chiefly from overseas countries, which has caused a lack of business.

In the railway car industry the full complement of workmen is only maintained in the expectation of orders on reparations account. Business in shipbuilding has become very quiet. Orders from domestic sources have almost stopped and those from abroad can be obtained only by strong efforts and at a sacrifice in prices. Electrical machinery, which so far has enjoyed a privileged position in machine building independent of general market conditions, is still fully employed, but complaining of a strong decline in new orders. It appears that a number of plans for new electrical power stations and extensions have been pigeon-holed. The only exception in this field seems to be railway signal engineering, which was the last to profit from the boom and evidently has not been seized yet by the receding of the tide.

Tool Industry Stagnant

In the machine tool industry the decline of business, commencing in September, has become more acute. The number of orders received for home demand, as well as from abroad, is diminishing perceptibly. The export of machine tools, which in August has exceeded that of July, shows a drop in September. The actual shipments in August were 10,127 units weighing 3,881 tons as against 9,371 weighing 2,983 tons in July. In value this increase was much higher, i.e., 182 million marks in July to 411 million marks in August. By translating these figures into gold marks, this increase, however, not only collapses, but leaves even a deficit.

The July exports show a price per ton of 61,301 marks or, at the average rate of exchange, of 585 gold marks. In August the respective figures were 106,000 paper marks or 400 gold marks. The increase of exports in August falls chiefly to the share of Belgium and Austria, while shipments to Holland, Spain and some other countries show a decline. The grand total of machinery exports in August was 42,850 tons as against 36,380 in July. The respective value was 4,081 million marks in August compared with 1,761 in July. In spite of the increase of the quantity and the apparent rise of value in paper marks, their value, in gold marks, shows no increase.

Great alarm has been caused in the machine building industry by the doubling of the export tax. A special meeting of the Society of German Machine Building Works, which is now heading all German machine building associations, has been convened to protest against this increase and against the view entertained in public opinion, as well as in official circles, that machine builders are reaping enormous profits out of the exchange situation. Various speakers, amongst them Direktor Becker, of one of Germany's largest machine tool building works, the Kalker Machine Tool Works, maintained that freight and the taxes, levied on exports, leave to the manufacturer a net price hardly as high as domestic prices.

Fictitious Paper Profits

The price of raw materials has already reached the world market level. The only advantage remaining to German machine building in comparison to foreign competitors, it was said, is the low cost of labor, which is, however, largely counteracted by the drop in efficiency. Taking into account the cost of transportation and foreign import duties, there is, so it was said, hardly any margin left for the German manufacturer to make his price attractive to foreign buyers.

The profits paid out in paper marks are in no case more than from 2 to 3 times their pre-war figures in spite of the enormous depreciation of the money. This was said in corroboration of the contention that the financial situation of the machine building industry is by no means as satisfactory as it appears on the surface. A scrutiny of the dividends paid in the machine tool industry, which is one of the most fortunate lines, provides, indeed, a striking illustration of this fact. From the annual reports of a number of works just published, the figures in the accompanying table are of particular interest:

It is seen from these figures that the capital stock has increased, but not nearly commensurate with the depreciation of the money. This, in itself, is a healthy sign, as the increase has in most cases been put into the shape of tangible assets. The profits paid out

TABLE SHOWING CAPITAL STOCK AND COMPARATIVE PROFITS OF PRINCIPAL GERMAN TOOL BUILDERS

	Capital million marks 1914	Capital million marks 1922	Profits Paper Marks	1921/22 Gold Marks	Profits 1914 Marks	Sinking Funds Marks
Kalker Maschinenfabrik Breuer-Schumacher	3,6	7,2	2,430,000	2,000	500,000	7,000,000
Werkzeugmaschinenfabrik Gildemeister	1	4	1,460,000	1,460	60,000	600,000
Deutsche NilesWerke	4	10	4,690,000	4,690	386,000	1,800,000
Schs. Werkzeugmasch. Bernh. Escher	1,5	5	3,600,000	3,600	150,000	530,000

appear, indeed, huge, but expressed in gold marks they drop down to the level of a mere pittance. Compared with pre-war profits, they are almost nil. This explains better than arguments the cramped financial situation even of works highly prosperous on the surface. The whole capital basis of the works seems absurdly inadequate for the huge and ever increasing sums required in the shape of working capital.

In July all of the German corporations received fresh capital only to the extent of 2,706 million marks, in August of 3,751 and in September of 3,715. In gold money this fresh capital amounted in July to 22 million marks and in September only to 10 million marks. The respective figures for September, 1920, were 43 million gold marks and 1921, 30 millions. The actual value of new investments in industry has, therefore, decreased considerably. In machine building, 84 corporations increased their capital by 833 million marks and 72 new corporations have been formed with a capital of 282 million marks. Machine building by far heads the list in this respect among all other lines of industry.

In view of the business depression, which is apparently continuing the attention given to reparations is strongly increasing. Little is heard as yet of actual results achieved by the Stinnes agreement, which, as will be remembered, is the largest working arrangement made so far for reparations in kind, but greatest interest is focussed on the problem as to how it will work out in practice. Numerous manufacturers are trying to establish connection with the Stinnes combine or similar enterprises, of which an additional number are in the state of preparation.

To the same impulse must be ascribed the renewed attention the Russian market is receiving in Germany. An agreement recently arrived at between the firm of Otto Wolff (which is probably the greatest new company organized since the war and controlling the sales department of a number of iron and steel works of the first rank and also several machine tool works) on the one hand and the Russian Government on the other, has added fresh zest to this movement. This agreement is the first on a large scale for the iron, steel and machinery industry and the largest yet concluded. A similar agreement is nearing completion between the Russian State and the firm of Krupp, only awaiting the solution of the problem of financing. In this connection it may be mentioned that the Society of German Engineers is now publishing in conjunction with the Soviet Government a Russian edition of their journal, which is going to be distributed broadcast in Russia through official channels. This enterprise is strongly supported by German industry, which is more than ever alert to the opportunities which the Russian market offers in the future.

Leather Belt Exports Increase in October

According to figures compiled by the Bureau of Foreign and Domestic Commerce, the United States exported 91.1 per cent more pounds of leather belting in October last than in October, 1921, and 3.8 per cent more than in September, 1922.

Simonds Stimulates Study of Economics

Actuated by the desire to advance the study, and more general appreciation of economics, Alvan T. Simonds, President of the Simonds Saw Co., Fitchburg, Mass., and Chicago, Ill., proposes an essay contest open to pupils of high schools and normal schools in the United States and Canada. Mr. Simonds offers two prizes of $1,000 and $500 for the best essays written by students on the subject: "The Lack of Economic Intelligence and Some of the Injuries it has Caused Individual and General Welfare in the United States since 1860."

Mr. Simonds hopes this contest will interest many in the study of economics, who might otherwise pass it by. He also expects it will aid in creating a public sentiment that will result in the practical study of the subject in secondary schools as part of the training of every teacher. By way of suggestion, the donor of the prizes points to the fact that unemployment, hard times, and business failures are economic disorders, which like the diseases of the human body can be avoided by greater economic intelligence. The essays which Mr. Simonds anticipates should deal with facts of this kind as well as explain concrete examples of injury to individual or general welfare, due to lack of economics intelligence. The readiness of many to accept economic fallacies and to act upon them is another phase of the subject writers may dwell upon.

As a foundation from which the essays may be constructed Mr. Simonds suggests that facts and examples which bear on the subject should come from the history of the United States since 1860 with special emphasis upon the present.

Rules governing the contest have been prepared, and persons interested may obtain copies of them by addressing the Simonds Economic Prize Contest, 470 Main Street, Fitchburg, Mass.

New Enterprises Total $808,719,600

Returns specially compiled by the *Journal of Commerce* indicate that seventy-six new companies were organized under the laws of the principal states during November with an authorized capital of $100,000 or more, involving the sum of $808,719,600. This is the best monthly showing in some time. In November a year ago 720 companies were incorporated with a combined authorized capital of $367,956,100. The October returns of this year showed that 756 companies took out charters, representing a total of $651,577,390.

Since Jan. 1 there were 8,685 new concerns chartered with a combined capital of $7,586,252,390. During the first eleven months of 1921 8,744 companies filed articles of incorporation, representing a grand total of $7,340,539,100.

As usual Delaware easily makes the best showing in the returns, followed by Pennsylvania, New York, New Jersey and Massachusetts.

The increase noted in the figures illustrates probably better than anything else that optimism prevails in banking and industrial circles regarding the outlook for general business.

November Brought More Failures

There were 1,758 failures reported to Bradstreet's for the month of November, an increase of 9.8 per cent over the total for October and the largest number reported in any month since May. Compared with November a year ago failures were 10.7 per cent fewer in number, but there was 64 per cent more than in November, 1920, and over four times as many as in November, 1919.

As regards liabilities, it might be noted that the November total this year, $54,080,825, is 46 per cent in excess of those for October, and the largest for any month since April. The total is, however, 25.7 per cent below that of November a year ago, though 21 per cent above the total for November, 1920. As compared with November, 1919, liabilities for the month just ended are more than six times as great.

Business Items

The Ramsdell Tool and Manufacturing Co., of Worcester, Mass., has recently been incorporated under the laws of Massachusetts, to engage in the manufacture of tools, etc. Their capital stock is $25,000, and the officers are: President and treasurer, Frederick M. Ramsdell, 41 Irving St., Worcester; and secretary, William H. Ramsdell.

The New Haven Malleable Iron Co., New Haven, Conn., has recently increased their capital stock from $50,000 to $150,000.

The Locomobile Co. of America at Bridgeport, Conn., by order of Referee Keogh, has been formally transferred to the trustees of the new Locomobile Co. of America, a New York corporation, controlled by W. C. Durant, president of Durant Motor Co..

The Spotz Manufacturing Co., Inc., of Stamford, Conn., recently incorporated to engage in the manufacture of machinery, etc. (as per item published in a recent issue of the *American Machinist*), organized the past week by the election of the following officers: Harry M. Rice, president; C. A. Spotz, vice-president; Carleton Pratt, treasurer; and A. H. Emory, Jr., secretary.

The Buell Brothers Co., Clinton, Conn., has recently been incorporated under the laws of Connecticut, to engage in the general manufacturing business, making metal novelties, specialties, etc. The capital stock of the concern is $25,000, and the firm will commence business with $25,000. The incorporators are William H. and G. V. Buell, both of Lowell, Mass.; Edgar and S. M. W. Buell, both of Clinton, Conn.

The Brightman Manufacturing Co., located on Marion Rd., Columbus, Ohio, has been reorganized following the purchase of the stock from L. H. Brightman and Mary C. Brightman, by a syndicate headed by William C. Waggoner of Chicago. In the reorganization William C. Waggoner was elected president; J. P. Dodds, who has been general manager, was named vice president and general manager; R. C. Johnson, secretary, and Paul A. DeLong, treasurer. These officers with Thomas

Ferry, of the Ferry Cap and Screw Co., of Cleveland, constitute the board of directors. The concern will manufacture shafting, shafting equipment and steel nuts.

Briggs & Turivas, Inc., Westminster Bldg., Chicago, Ill., has purchased the iron and steel plant of Frederick Cowin and Co., Inc., Joliet, Ill., formerly the Joliet Rolling Mills. The plant is a complete one, consisting of a combination 8-in. and 12-in. finishing mill, 12-in. and 16-in. finishing mill and a 22-in. muck mill. It has a capacity of 5,000 tons monthly of finished iron and steel and five railroads serve the property. Whether the plant will be sold by Briggs & Turivas, Inc., as a going proposition or dismantled by them is not yet known.

The Monitor Controller Co., of Baltimore, manufacturer of the "Just Press a Button" system of automatic control for all motor-driven apparatus have recently established in the south a branch office at 1100 Elm St., Birmingham, Ala. William H. Neville will be in charge.

The Bemis Car Truck Co., 369 Birnie Ave., Springfield, Mass., is about to build an addition to its plant, to cost $15,000. It will be a one-story structure, 55 feet wide by 141 feet in depth.

The Bead Chain Manufacturing Co. of Bridgeport, Conn., manufacturer of the bead chain for electric light sockets, during the past week increased its capital stock from $50,000 to $300,000, same to be used mostly to increase production.

The Westfield (Mass.) Manufacturing Co. has changed its name to the Westwire Co. Production of screw machine products, punch press work and radio goods will continue to be the concern's principal lines.

The Coburn Machine Co., has been incorporated at San Diego, Cal., to deal in automobiles and machinery, and to carry on a machine shop with a capitalization of $50,000, of which $300 is paid up. The incorporators are W. E. Coburn, C. W. Coburn and L. B. Henderson.

The Ross Cutter and Machine Works, Inc., Boston, Mass, is the name of a new company recently incorporated by J. A. Ross and J. E. Bellows, formerly associated with the S. A. Woods Machine Co. The new concern will manufacture woodworking cutters and knives.

The plants of the American and British Manufacturing Co., at Bridgeport, Cann., and at Providence, R. I., have been ordered sold by Judge John C. Knox of the United States District Court of Southern New York district. Bids for the plants will be opened Dec 22 by Receiver George C. Van Tuyl, Jr., at the offices of Messrs. Flaherty, Turner & Stevens, 2 Rector St., New York City. Both plants are extensive, the one at Bridgeport alone consisting of about seven acres of ground, and about sixteen major factory structures, with spur tracks and dockage facilities. A certified check for 10 per cent is to accompany all bids.

The V. & O. Press Co., manufacturer of presses, dies and sheet metal working machinery, and for many years located in Glendale, Brooklyn, N. Y., has started work on a new factory at Hudson, N. Y., where the business will be moved about May 1, 1923. The new building will give improved and increased facilities for the manufacture of the company's high grade products, and will also enable the company to broaden the scope of its operations.

The Delta Manufacturing Co., manufacturer of needles for talking machines, has removed its plant from Lowell to Westfield, Mass., and installed its machinery in the Westfield Power Co. building.

The Ohio Valley Machine Shop, Moundsville, W. Va., has under construction a large addition to its works on Thompson Ave., in that city.

The Watkins Manufacturing Co., Wichita, Kan., through E. A. Watkins, president, announces that it will add a new addition to its plant in the near future. The firm will spend approximately $12,000 on a new machine shop addition and it is proposed also to house a part of the Kansas planing mill in this new building.

The Baldwin Locomotive Works has booked new business amounting to $58,919,345 during 11 months of this year, compared with $26,924,126 for the same period in 1921.

The Studebaker Corp. last week ordered a stock dividend of 25 per cent paid to common stockholders. Directors at a special meeting took the action necessary for the payment of the stock disbursement. The distribution will be made on Dec. 29 to holders of record as of Dec. 16. No action by stockholders is necessary, as the corporation has authorized common capital of $75,000,000 of which only $60,000,000 is outstanding.

Personals

C. G. TAYLOR has been appointed director of purchases of the Westinghouse Electric and Manufacturing Co., according to an announcement by officials of the company. He will have general supervision of the purchasing activities of all plants, comprising the electrical group, including the East Pittsburgh; East Springfield, Mass.; Newark, N. J.; Mansfield, O.; Cleveland, O.; Trafford, Pa.; South Bend, Ind.; Homewood, Pittsburgh, and Derry, Pa., plants.

WALTER B. LASHAR, president of the American Chain Co., Bridgeport, Conn., and well known industrially throughout the United States, is recuperating at the Bridgeport Hospital, after an operation for appendicitis.

William H. Raye, president of the Laconia (N. H.) Car Co., manufacturer of trolley cars, etc., has been elected president of the reorganized Walter M. Lowney Co., of Boston, maker of the famous "Lowney" chocolates, candies, et cetera.

L. M. WAITE has been made general manager of the Garvin Machine Co., Spring & Varick St., New York City.

J. F. MITCHELL, for the past two years in charge of the tool-making department of the Weston Electrical Instrument Co., Newark, N. J., has severed his connection with the company.

G. A. SAWIN, assistant to the manager of the supply department of the Westinghouse Electric and Manufacturing Co., has been elected chairman of the committee on instruments and measurements of the American Institute of Electrical Engineers. He has been a member of the Committee since 1920.

GEORGE J. KELLER, who has been identified with the Hannifin Manufacturing Co., Chicago, manufacturer of air-operated chucking equipment and adjustable boring and reaming bars, has been appointed district representative of the company for northern Ohio with headquarters at 1411 Savannah Ave., Cleveland, Ohio.

GEORGE L. ERWIN, who has been for the past ten years with the St. Louis office of Manning, Maxwell & Moore, is now with the sales department of the Chicago office of Kerney & Trecker. He succeeds H. H. Shierk, who is now with the Chicago sales department of the Miehle Printing Press Co.

Obituary

JAMES J. MCCARTHY who has been prominently indentified in the Railway Supply business for many years died on Nov. 25, at his late residence, No. 4800 Kimbark Avenue, Chicago, Ill., at the age of 80. Mr. McCarthy was one of the original organizers of the Independent Pneumatic Tool Co., and served as a director up to the time of his death. He also organized the Chicago-Cleveland Car Roofing Co., and up to the time of his death had taken an active part in its business.

Forthcoming Meetings

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

American Foundrymen's Association, Annual convention and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials, Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

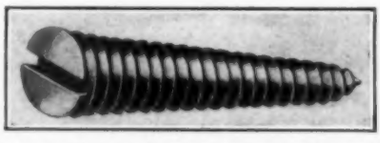
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Kritiscope, for Determining Critical Points in Steel, Nilson
Herman H. Sticht & Co., 15 Park Row, New York, N. Y.
"American Machinist," October 19, 1922

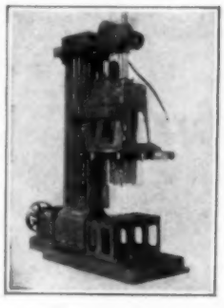
The device is for use in determining the critical points when heat-treating steel. The points or arrests that occur while the part is being heated can be detected magnetically. The tool is touched to the steel and drawn away slightly. If the bar or indicator remains in contact with the work, the latter is still magnetic and requires further heating. The indicator is magnetized by induction from a permanent magnet which, located within the body of the device, is protected from over-heating by the walls. The Kritiscope is packed in a wooden case with extension rods and a shield. It does not require calibration and is not affected by vibration or rough handling.

Wedge, Take-Up, Hammer Handle
Fayette R. Plumb, Inc., Philadelphia, Pa.
"American Machinist," October 19, 1922



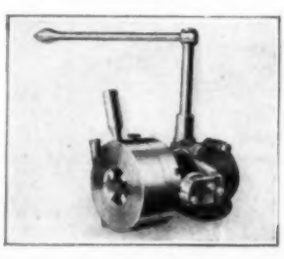
The device provides for retightening the handle in the head of a hammer or hatchet, and consists of a tapered screw of uniform pitch. A slot in the butt end of the screw is for the screwdriver. To fit the screw to a tool, a hole is drilled in the end of the handle somewhat deeper than the length of the screw. It is then reamed to receive the screw, which is driven in until the butt end is flush with the handle. If the head becomes loose in the handle, a slight turn of the screw again spreads the wood uniformly so that it grips in its socket. The screw thread prevents the wedge from flying out under shock.

Drilling Machine, High-Speed, Multiple-Spindle, No. 2A
Baush Machine Tool Co., Springfield, Mass.
"American Machinist," October 26, 1922



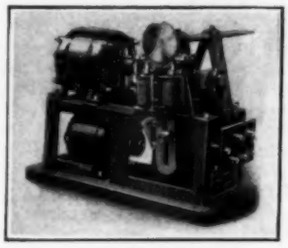
In this machine, the feed pressure is applied directly over the center of the drilling area when a gang of drills is being used in one head. Heads of various sizes, both round and rectangular in shape, can be supplied. Four different methods of drive can be furnished, a three-speed cone pulley, a three-speed change-gear box, motor or belt-driven, or a direct-connected variable-speed motor. Roller bearings are used for shafts and ball thrust bearings wherever required. The machine can be built for tapping in addition to drilling. Capacity in cast iron, twelve 1-in. drills, or the equivalent. Feed, from 0.0018 to 0.023 in. per spindle revolution. Floor space, 3 ft. x 8 ft. 10 in. Height, 12 ft. 3 inches.

Die, Threading, Taper, "Hartness"
Jones & Lamson Machine Co., Die Division, Springfield, Vt.
"American Machinist," October 26, 1922



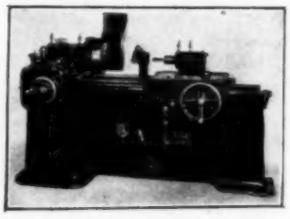
The self-opening die has been redesigned for cutting threads of any taper from zero up to a 2 in. taper per foot. Set for the maximum taper, the die will cut threads 1⅞ in. long and proportionately longer as the angle approaches the minimum. It is adapted to the cutting of staybolt threads and may be used in tandem with another die in the rear for cutting the parallel-sided portion of the thread. The short handle on the die sleeve is pushed forward until the former pin is brought into the slot in the adjustable former, and the die withdrawn to its extreme position by the pinion lever at the top. Capacity: No. 3 size, threads 1¼ in. in diameter at the large end; No. 6, threads up to 2 in. in diameter.

Temperature Regulator, Automatic, Gas Furnace
Chas. Engelhard, Inc., 30 Church St., New York, N. Y.
"American Machinist," October 19, 1922



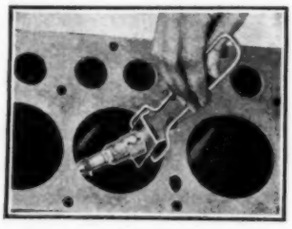
A generator has been added to the former model to provide the low-voltage current formerly supplied from an outside source. The generator is run by a motor operating on current from a lighting circuit. The position and arrangement of the solenoids have also been changed and the terminal board has been added at the end of the frame. The device is ordinarily connected by means of chain to the valve on the gas pipe feeding the furnace, and is connected electrically to a pyrometer. It has three main parts, the motive power, the escapement mechanism and the timer, the motive power consisting of a $\frac{1}{75}$-hp. a.c. or d.c. motor, an 80 to 1 worm-gear reduction, and a 25-watt, 6-volt, d.c. generator to furnish the power for the solenoids.

Grinding Machine, Internal, Automatic, No. 12
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
"American Machinist," October 26, 1922



In this machine, an automatic gaging mechanism is incorporated and correlated with the driving and feeding mechanisms. After the operator chucks the piece and starts the feed, the machine will grind to the finished size, automatically trip the carriage feed, and return the carriage to the rest position. The machine is motor driven and equipped with push-button control. The work head is mounted on a circular bearing fitted to a cross-slide. The wheel carriage is reciprocated hydraulically and the driving motor is mounted directly beneath the spindle. The carriage has a maximum travel of 20 in. and six traversing speeds. Capacity, holes ¾ to 10 in. in diameter; 9 in. in depth. Swing over the ways, 13 in. Floor space, 7 ft. by 4 ft. 2 in. Weight, 4,400 pounds.

Gage, Micrometer, Inside, Self-Aligning and Centering
L. O. Beard Tool Co., Lancaster, Pa.
"American Machinist," October 26, 1922



The micrometer gage is for measuring the diameters of automotive cylinders, the measuring member being held at right angles to the cylinder walls. The gage consists chiefly of the aligning base, the handle and the micrometer proper. It is furnished in three sizes with ranges of 2½ to 3 in., 3 to 3¾ in., and 3¾ in. to 4½ in. One turn of the screw advances it 0.050 in. The barrel is graduated to 0.001 in. and figures indicating steps of 0.005 in. are placed on both the spindle and the barrel, those on the former member serving as a check for the reading. The micrometer is locked by means of the setscrew to preserve the reading, and the base slid forward on the barrel so that the tool can be tilted and removed from the cylinder.

Bolt and Capscrew Shaving Machine
Asa S. Cook Co., Hartford, Conn.
"American Machinist," October 26, 1922

The machine, a re-design of the former model, is driven by a single belt from the lineshaft connected to a countershaft under the pan. Separate carriers hold the tools, which face the shoulder under the head and form the top of the head. A gripping device catches each screw as it falls from the feed race. The hopper is stationary and has an annular groove close to the side walls. The ring at the bottom of the groove is revolved with the agitator so that the outer circle of bolts moves continuously toward the high side, where the bolts are discharged into the feed race and supported by the shoulder under the head. The speed may be varied by the driving gears to keep the feed race full of work at all times.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Ala., Birmingham—Inter City Bus Line, (garage and machine shop)—lathe, drill press, emery wheel and stand, belting, electric drill, arbor press, shaft, 2 ton chain falls, hangers and pulleys.

Conn., Waterbury—F. L. Reid, R. F. D. Route 5, (tool work)—one 14 in. Hendey lathe and other small tool room equipment.

Ky., Louisville—Louisville Garage Co.—equipment for proposed $100,000 garage and service station on 5th St.

La., New Orleans—Auto Hospital, 620 Julia St., A. Bray, proprietor—one electric drill for heavy work, and one 12 in. lathe.

Md., Baltimore—Baltimore & Ohio R.R. Co., Baltimore and Charles Sts., W. S. Galloway, Purch. Agt.—angle straightening machine.

Mich., Ann Arbor—American Auto Sales Co., 310 East Washington St.—milling machine, drill and straightening presses for automobile repairing.

Mich., Detroit—Inter City Bus Line, 207 South Woodward Ave.—drill press, 12 x 14 in. lathe, emery wheel and stand and arbor press (used).

Mo., Kansas City—H. R. Bremer, 413 North Drury Ave., (machine shop)—lathe, motor, chucks and small machinist hand tools.

N. Y., Buffalo—Eagles & Kiener, 3074 Main St. (garage)—tools for repair shop.

N. Y., Buffalo—A. B. Goehler, 288 Genesee St.—equipment for machine shop.

N. Y., Buffalo—E. Hank & W. C. Radel, Genesee and Johnson Sts.—equipment for service station, including 1,000 gal. gasoline tank and pump.

N. Y., Buffalo—E. E. Harris & Co., 22 Maurice St.—equipment, including two 1,000 gal. gas tanks and pumps for service station on Tonawanda and Ontario Sts.

N. Y., Buffalo—J. Kahabka, 1261 Fillmore Ave.—equipment for automobile repair shop.

N. Y., Buffalo—Kensington-Davis Corp., 144 Kensington Ave., R. E. Lynd, Purch. Agt.—equipment for metal foundry and machine shop.

N. Y., Buffalo—Pennzoil Co., Inc., 158 Pearl St.—equipment, including 1,000 gal. gas tank and pump for service station at 2082 Niagara St.

N. Y., Buffalo—Valyear Electric Service Co., 2467 Niagara St.—equipment, including 550 gal. gas tank and pump for service station at 145 Ontario St.

N. Y., Jamestown—Standard Oil Co., of New York, 258 Crescent St.—tools and mechanical equipment for $8,000 gasoline and service station on South Main St.

N. Y., New York—H. Kleinert, 920 Brook Ave., (machine shop)—drill press and small screw engine.

N. Y., Rochester—North East Electric Co., 348 Whitney St., (electric starting systems)—one Wieland standard 6 in. pipe threader and cutter; one No. 66 Jarecki pipe machine (used).

N. Y., Rochester—M. Wagner, 186 Franklin St.—tools and equipment for garage and automobile service station.

O., Columbus — Anchor Concrete Mchy. Co., 530 Dublin Ave., E. F. Olsen, Adrian, Mich., Purch. Agt.—planer and 1 or 2 lathes for factory at Adrian, Mich.

O., Columbus—Capital Lift & Mfg. Co., 302 Comstock Bldg., F. M. Taylor, Purch. Agt.—36 in. lathe and one drill press for proposed machine shop.

O., Columbus—Scott & Leiby, rear 135 North Front St., R. S. Leiby, Purch. Agt.—metal working machinery, including cutting off machine and slotting machine.

Okla., Henryetta — Colonial Supply Co., (manufacturer of oil well supplies, etc.)—machine shop equipment for works at Weleetka.

Pa., Carlisle—Miller Bros.—machine shop and automobile service shop equipment to replace that which was destroyed by fire.

Pa., Pittsburgh—H. D. Shawkey Motor Co., 5526 Penn Ave.—machinery and tools for proposed repair department on Penn and Pacific Aves.

Pa., Pittsburgh—National Tube Co., Frick Bldg., S. M. Lynch, Purch. Agt. — large hydraulic press.

Wis., Milwaukee—Bahde Mfg. Co., 2621 Vine St., (manufacturer of patented mechanical articles), C. A. H. Bahde, Purch. Agt.—24 in. shaper.

Wis., Milwaukee—E. Scheunemann, 1445 26th St.—sheet metal working machinery, including brake, bender, etc.

Wis., Sheboygan—F. Heuer, 1608 South 13th St.—automobile repair machinery for new garage and repair shop.

Wis., Watertown—Breuer-Stone, Inc., c/o W. C. Stone, Bank or Watertown Bldg.—machine tools and machinery for the manufacture of specially designed machinery.

Wis., Waukesha—Spring City Auto Co., 220 West Main St.—repair machinery and motors for proposed garage.

Wis., West Allis — G. Richards, 7125 Greenfield Ave.—one lathe for automobile repair work.

Machinery Wanted

Ark., Texarkana — Williams-Hubbard Peanut Co., A. Williams, Purch. Agt. — power paper cutter.

Calif., Los Angeles — Webber McCrea Book Binder Co., 202 East 4th St., A. Webber, Purch. Agt.—ruling machine feeders.

Calif., San Fernando—R. H. Glenn, (job printer)—newspaper press.

Conn., Waterbury—Case Metal Wks.—shear for cutting ½ in. brass.

D. C., Wash.—J. A. Wetmore, Acting Supervising Archt., Treasury Dept.—receiving bids until Dec. 28, laundry machinery for the U. S. Veterans Hospital, Bronx, N. Y.

Ga., Union Point — Union Mfg. Co., (manufacturer of hosiery, paper boxes, etc.)—one Payne bobbin winder and one Sargents yarn conditioning machine.

Ky., Salem—G. D. Hearne—machinery and equipment for the manufacture of zinc and byproducts.

Ill., Chicago—G. E. Corbett Boiler & Tank Co., 1332 Cortland St.—three 1 ton electric hoists.

Ill., Chicago—Empire State Ice Co., 76 West Monroe St.—$225,000 worth of ice and refrigeration machinery.

Ill., Chicago — Guarantee Sign Service Corp., 430 South California Ave., W. Dresden, Purch. Agt.—2 power job printing presses, Stone power paper cutter and other printing equipment.

Ill., Chicago — Landfield & Bloom, 128 North Wells St., (printer), V. Notary, Purch. Agt.—Gordon press and paper cutter with power attachment.

Ind., Evansville — Globe, Bosse, World Furniture Co., 600 West Maryland St.—woodworking machinery and equipment for addition to plant.

Ind., Indianapolis—J. Briggs, 3323 Park Ave.—machinery and equipment for the manufacture of stucco and concrete products.

Ind., New Albany—Period Cabinet Mfg. Co.—machinery and equipment for addition to furniture factory.

Kan., Wichita—Alpine Ice Co., 13th and Rock Island Sts., C. M. Beachy, Purch. Agt.—90 ton ice machine, belting, pulleys, hangers, bearings and motor.

Kan., Wichita—Jacob Dodd Packing Co., 21st St. and Lawrence Ave.—refrigeration equipment for proposed plant.

Kan., Wichita—B. Roberts, 1423 North Lawrence Ave. (job printers)—linotype machine (used preferred).

Ky., Whick—G. Noble—additional coal mining machinery and equipment.

La., Arcadia—Bienville Democrat—12 x 18 in. Chandler & Price job press, remelting furnace, linotype and matrix box.

La., Coushatta—Gulf State Land & Lumber Co.—machinery and equipment, electrically driven, for lumber mill and plant.

Mass., Boston—Armstrong Knitting Mills, 99 Chauncy St.—machinery for addition to knitting mill at Roxbury.

Mass., Bridgewater—L. Q. White Shoe Co.—several glass folding machines for present factory (used); also machinery for proposed factory.

Mass., Brighton (Boston P. O.)—M. A. Lang, 238 Western Ave.—machinery and equipment for new bakery at 37 Everett St.

Mass., Brighton (Boston P. O.)—New England Spun Silk Corp., 342 Western Ave., (manufacturer of silk specialties)—additional machinery (new or used).

Mass., Cambridge (Boston P. O.)—Palmer Electric & Mfg. Co., 175 5th St.—one power shear for cutting 14 gauge plate.

Mass., Clinton—Roubaix Mills, Inc., 79½ Main St., (woolen mills)—additional machinery for dye house.

Mass., Dorchester (Boston P. O.)—James Russell Boiler Wks., 9 Dewar St., (boiler specialties)—machinery and small tools for new addition to shop.

Mass., Everett—Bd. Educ., c/o R. Hobbs, E. H. Newton, Chn. Purch. Comn.—woodworking and metal working machinery and tools for manual training department of new high school.

Mass., Fitchburg—St. Francis Mills, (cotton mills), R. B. Lowe, Pres., c/o Parkhill Mfg. Co.—additional machinery for mill.

Mich., Lansing—Federal Drop Forge Co., South Washington St., M. R. Carrier, Genl. Mgr.—drop forge hammers and die sinking equipment.

Minn., Lake Crystal — Graphic, (newspaper)—24 x 30¼ in. chassis for press.

Mo., St. Louis—J. Heidemann, 1454 St. Louis Ave.—oil pumps and storage tanks for filling station on Blair St. and St. Louis Ave.

Mo., St. Louis—L. S. Williams, 3232 Pine St. (undertaker)—oil pumps and storage tanks for filling station at 4017-19 Finney Ave.

Mo., Springfield—B. L. Munell, R. O. Box 249 (contractor)—rock crusher.

Neb., Lincoln — Mayer Bros. Co., 1007 19th St., Fairbanks platform scales, to weigh up to 1,000 lb.

N. J., Essex Fells—Evans Lead Co., S. M. Evans, Pres.—machinery and equipment for plant, for the manufacture of lead, red lead, oxide, etc., at Charlestown, W. Va.

N. Mex., Lakewood—G. E. Wedel—knitting machinery.

N. Y., Batavia — Batavia Rubber Co., Robertson St., W. Freeman, owner, (manufacturer of tires and tubes)—machinery and equipment to increase output of plant.

N. Y., Binghamton—Binghamton Caster & Specialty Co., Inc., c/o H. C. Miller, 11 Floral Ave.—machinery and equipment for the manufacture of casters.

N. Y., Buffalo—T. Chaltas, 187 North Pearl St.—candy making equipment.

N. Y., Buffalo—Ebbco Beverage Co., Inc., 449 Woodlawn Ave., C. J. Harnick, Purch. Agt.—equipment for the manufacture of beverages.

N. Y., Buffalo—Hoeffler Ice Cream Co., Inc., 296 Connecticut St.—machinery and equipment for the manufacture of ice cream products for branch plant at Niagara Falls.

N. Y., Buffalo—Lewis Electric Mfg. Co., 1400 Niagara St.—machinery and equipment for the manufacture of mechanical appliances.

N. Y., Buffalo—Seneca Iron & Steel Co., Erie County Bank Bldg.—machinery and equipment for addition to steel works at Blasdell.

N. Y., Cayuta—F. Vandrack, Jr.—one No. 11 or 12 power cutting machine.

N. Y., Chatham—Chatham Courier Co.—power saw with guides, suitable for sawing slugs or solid type-high casts.

N. Y., Cohocton—Wetmiller Dairy & Farm Products Co.—butter making machinery for proposed dairy.

N. Y., Elmira—James Mfg. Co., 700 Madison Ave., (manufacturer of farm equipment, silos, staunchions, etc.)—machinery and equipment for addition to plant.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Electrolytic copper quoted at 14½c. as against 14⅝c. per lb. in New York warehouses; copper market, generally, more stabilized. Tin showing betterment in buying; quoted at 38c. as compared with 36¾c., last week. Zinc advanced to 8c. as against 7⅞c. per lb. Linseed oil firmer, with no change in quotations. Improvement also shown in lard oils.

Declines—Coke and pig-iron prices, softer. Basic and No. 2 foundry iron down $2.50; now $25 per ton at Pittsburgh, including freight from valley. Steel shapes quoted at minimum of $1.90 per 100 lb., Pittsburgh, for delivery in first quarter of 1923; as high as $2.10, however, has been quoted on orders for immediate shipment. Plate tonnages not being placed so readily; quotations now $1.90@$2 per 100 lb., at mill. Plate buying mostly for tank construction and railway use. Bars, $1.90 for first quarter delivery; current business still at $2 per 100 lb.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.55
Northern Basic	28.27
Southern Ohio No. 2	29.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	32.44
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.64
Virginia No. 2	33.17
Basic	28.00
Grey Forge	28.64
CHICAGO	
No. 2 Foundry local	28.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	30.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cincinnati	4.5@6
New York	5.5
Chicago	4@5
Cleveland	2.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50	4.19	3.70	4.00
No. 12	2.60	4.24	3.75	4.05
No. 14	2.70	4.29	3.80	4.10
No. 16	2.90	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20@3.35	4.70	4.20	4.70
Nos. 22 and 24.	3.25@3.40	4.75	4.25	4.70
Nos. 25 and 26.	3.30@3.45	4.80	4.30	4.75
No. 28	3.35@3.50	4.90	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35@3.50	4.90	4.40	4.85
Nos. 12 and 14.	3.45@3.60	5.00	4.50	4.95
Nos. 17 and 21.	3.75@3.90	5.30	4.80	....
Nos. 22 and 24.	3.90@4.05	5.45	4.95	5.40
No. 26	4.05@4.20	5.60	5.10	5.55
No. 28	4.35@4.50	5.90	5.40	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	66	54½	¾ to 1½	34	19
LAP WELD					
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	64	53½	¾ to 1½	34	20
2 to 3	65	54½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
3/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.50
Tin, 5-ton lots, New York	38.00
Lead (up to carlots), St. Louis, 6.95@7.00; New York	7.45
Zinc (up to carlots), St. Louis, 7.30@7.35; New York	8.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	23.00	23.00
Antimony (Chinese), ton spot	7@7.25	8.50	7.75
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	16.00	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.50	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.00	15.75
Brass wire (carlots)	19.00	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ½), (caselots)	27.50	24.75	20.00
Babbitt metal (83% tin)	35.00	47.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.50	12.00
Copper, heavy, and wire	11.75	11.75	11.50
Copper, light, and bottoms	9.75	10.00	10.50
Lead, heavy	4.75	5.50	5.75
Lead, tea	4.25	4.50	4.75
Brass, heavy	7.00	9.50	9.25
Brass, light	6.00	5.50	6.00
No. 1 yellow brass turnings	6.50	6.50	7.00
Zinc	3.00	4.00	4.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.00	11.00	14.50
IC, 112 sheets	12.30	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	6.00	7.25
IC, 14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11¼
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13¼x13¼, per lb.	.16	32.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.90	1.01	.95
White lead, dry or in oil	100 lb. kegs.	New York, 13.25	
Red lead, dry	100 lb. kegs.	New York, 13.25	
Red lead, in oil	100 lb. kegs.	New York, 14.75	
Fire clay, per 100 lb. bag		.65	
Coke, prompt furnace, Connellsville	per net ton	$7.25@7.50	
Coke, prompt foundry, Connellsville	per net ton	7.50@8.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10-5%	50%
1¼ and 1¼x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	65-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

N. Y., Elmira—H. Sutter, 428 Erie St.—machinery for the manufacture of radio apparatus and appliances.

N. Y., Hornell—Dewitt Borg Co., (manufacturer of silk)—machinery and equipment for branch plant at Perry.

N. Y., Lockport—W. B. Ellis—machinery and equipment for the manufacture of automobile gears and transmissions.

N. Y., Lockport—Plasters News Co., 31 Locust St.—one tinner's complete outfit.

N. Y., Mount Morris—Bd. Educ.—vocational equipment for $100,000 manual training school.

N. Y., New York—Bristol Co., 340 East 38th St., (manufacturer of furniture)—steel veneer presses and several sizes of iron clamps.

N. Y., Owego—Bd. Educ.—vocational equipment for $275,000 high school.

N. Y., Penn Yan—Milo Ribbon & Carbon Co.—one 32 in. paper cutting machine.

N. Y., Rochester—M. Bednar, 42 University Ave.—one printing press with complete outfit.

N. Y., Rochester—Eastman Kodak Co., Kodak Park—machinery and equipment for refrigeration plant.

N. Y., Rochester—Wood Specialties, Inc., 124 Railroad St.—one automatic cutoff saw.

N. Y., Yonkers—Neidich Co., 247 South Bway.—test bench to test generators and starters.

N. C., Gastonia—H. H. Groves—equipment for proposed cotton mill for the manufacture of fine combed yarns.

N. C., Gold Hill—Rodrain Electro-Metallurgical Co.—machinery and equipment, including conveyors, transmission machinery, etc., for proposed gold mining plant.

O., Cleveland—The city, Comr. of Purchases, City Hall—one 10 ton traveling electric crane with switchboard, switchboard wiring and electric valve controls.

O., Cleveland—Iten Fibre Co., 2359 East 67th St.—one or more hand screw machines, ¾ in. capacity (used).

O., Columbus—Mathews Lumber Mfg. Co., 500 South Central Ave., W. A. Mathews, Secy. and Genl. Mgr.—molding machine, cutoff saw and other equipment for lumber mill.

O., Dayton — The Advance Fdry. Co., Parnell St.—10 to 15 ton electric crane, 40 ft. span (used).

O., Dayton — Crawford, McGregor & Canby Co., Albany St., (manufacturer of golf clubs, etc.)—machinery and equipment for $50,000 addition to plant.

O., Elyria—Colson & Co. (manufacturer of juvenile vehicles, etc.)—machinery and equipment for branch plant at Baltimore, Md.

O., Fosteria—Seneca Wire & Mfg. Co.—machinery and equipment for addition to wire products plant.

O., Middletown—Amer. Rolling Mill Co., Curtis Ave.—one alligator shear.

O., Wadsworth — Ohio Match Co.—machinery and equipment for addition to plant for the manufacture of matches, etc.

O., Youngstown—Federal Iron Wks., 70-76 Prospect St., (fabricaters, steel bridge timbers, fire escapes, etc.)—machinery and equipment to replace that which was destroyed by fire.

O., Youngstown—Ravinson Mantel Co., 70-76 South Prospect St., (manufacturer of mantels)—machinery and equipment to replace that which was destroyed by fire.

Okla., Tulsa—McCallum-Morris Electric Co. (manufacturer of electric fixtures), A. McCallum, Purch. Agt.—power job printing press, belting, hangers, pulleys and bearings (used preferred).

Ore., Medford—W. E. Sterns—machinery and equipment for proposed cold storage plant.

Ore., Portland—See-Der Mfg. Co., Larabee and Delay Sts.—complete line of planers, shapers, bandsaws, Universal wood worker, belting and shafting for proposed factory, for the manufacture of cedar chests, furniture and wood novelties.

Pa., Albion—N. Horton—blacksmith shop equipment.

Pa., Allentown — Independent Oil Co., Inc., Rialto Bldg.—machinery and equipment for oil plant on 12th St., to replace that which was destroyed by fire.

Pa., Allentown—Traylor Eng. & Mfg. Co.—castings for 60 in. gyratory crusher.

Pa., Blawnox—The Blawnox Co does not intend to purchase a 10 ton crane, as stated in our issue of Nov. 23.

Pa., Clairton—Bd. Educ., C. A. Bauman, Secy., 415 Caldwell St.—equipment for vocational department of proposed $350,000 Junior and Senior High School.

Pa., Meadville—C. L. Craine—machinery and equipment for the manufacture of patented arch supporters for shoes.

Pa., Narberth — Bd. Educ — vocational equipment for $165,000 school.

Pa., Norwood—Pennsylvania Equipment Co.—25 ton, 45 ft. boom, 8 wheel locomotive crane, equipped with clamshell bucket.

Pa., Phila.—Midvale Steel & Ordnance Corp., Widener Bldg.—alligator shear for Coatesville works.

Pa., Pittsburgh—Young Paper Mfg. Co., 245 1st Ave., (manufacturer of roofing and tarred felts)—machinery to replace that which was destroyed by fire.

Pa., Ridgway—Hyde Murphy Co., (manufacturer of planing mill products)—additional machinery and equipment for new $25,000 plant.

Pa., Rochester—Rochester Rubber Products Co., M. M. Goettman, Treas.—machinery and equipment for the manufacture of tires, tubes and other rubber products.

Pa., Sheffield—I. Ewan—machinery and equipment for the manufacture of patented baseball playing machine at Atlantic City, N. J.

Pa., Springfield—(Cumberland County)—Bd. Educ.—vocational equipment for $200,000 high school.

Pa., Wilkes-Barre—A. Hildebrand, 91 Wood St.—machinery and equipment for lumber and planing mill to replace that which was destroyed by fire.

Pa., Williamsport — Eureka Paper Box Co., Howard Ave. and Canal St.—machinery and equipment for paper box factory.

Pa., Williamsport—A. B. Faulkner, 720 5th Ave.—machinery for the manufacture of automatic illuminating changeable electric signs.

R. I., Providence—Goldberger & Brody, c/o G. Wolf, Archt., 88 Althea St.—equipment for proposed $55,000 garage on Pearl St.

Tenn., Chattanooga — Fountain City Lumber Co., J. V. Brantley, Secy.—machinery for the manufacture of automobile bodies.

Tenn., Harrogate—Lincoln Memorial University—power molding machine, power mixing machine, belting, hangers, pulleys and bake oven, for bakery.

Tenn., Memphis—W. C. Ellis & Sons Iron Wks., 235-245 South Front St., (heavy iron works, grease and oil machinery and manufacturer of warehouse trucks), H. C. Ellis, Secy. and Mgr.—machinery for plant.

Tenn., Morristown—J. P. Nanney Lumber Co.—24 in. four-side planer and matcher with Shimer heads; chain mortiser for doors and sash; single end tenonner; 12 or 16 in. jointer; 36 in. band saw; circular saw (motor driven machines preferred).

Tenn., Nashville—Southern Door & Glass Co., 218-220 North 2nd Ave., B. R. Patterson, Pres. and Treas.—complete woodworking machinery for small sash and door factory.

Tex., Bells—Jolly (newspaper)—10 x 15 in. Miller press, 6 quarto cylinder folder and Meistang mailer.

Tex., Colorado—T. Hughes, (cleaning plant)—tumbler, dry cleaner, cleaner, still, extractor, oil storage system, belting, hangers and bearings.

Tex., Lamesa — City Blacksmith Shop, Box 603—trip hammer for power equipment.

Tex., Sherman—Buffalo Refining Co.—additional oil refining machinery and equipment.

Tex., Sherman—J. T. Cobb, (manufacturer of soap)—soap press.

Va., Martinsville—A. D. Witten—furniture and woodworking machinery and equipment.

Va., Richmond—G. R. Graveley—machinery and equipment for proposed plant for the manufacture of auto tractors and agricultural equipment at Nansemond (Suffolk P. O.).

W. Va., Fairmont—Imperial Ice Cream Co., G. Strong, Pres.—ice and refrigeration machinery.

W. Va., Kenova—Morgan Bros. Lumber Co.—complete machinery and equipment for the manufacture of hardwood flooring.

W. Va., Lost Creek—Vulcan Coal Co., J. Quinn, Supt.—conveying and mining machinery.

W. Va., Morgantown—Shriver Coal Co., E. Bier, Pres.—mining machinery.

W. Va., Roderfield—Baldwin Pocahontas Coal Co.—tipple and conveying machinery for new mining field.

W. Va., Warwood—Contre Fdry. & Machine Co.—foundry and machine shop equipment.

W. Va., Williamson—G. B. Irvine—lumber mill machinery and equipment.

Wis., Appleton—Milhaupt Spring & Auto Co.—machinery and equipment for general automobile repairs; also for the manufacture of springs.

Wis., Cedar Grove—School District No. 1, M. J. De Master, Clk.—manual training equipment for new school.

Wis., Green Bay—Farmer-Labor Publishing Co., c/o F. H. Shoemaker, Box 34—presses and stereotyping outfit.

Wis., Jefferson—C. Baumann—special machinery for the manufacture of chocolate bars.

Wis., Milwaukee—Atherton Eng. Co., c/o M. H. Fuldheim, 425 East Water St.—machinery for the manufacture of radio supplies.

Wis., Milwaukee—A. Bergenthal, 83 Buffalo St.—power driven refrigeration machinery.

Wis., Milwaukee — Cahill & Douglas, Engrs., 217 West Water St.—2 ton ice machine.

Wis., Milwaukee—Midwest Rolling Mills, c/o J. E. Kiefer, 835 Caswell Block—rolling mill equipment for the manufacture of seamless brass and tubing.

Wis., Milwaukee—G. A. Mixer, 1394 Green Bay Ave., (publisher) — presses; lithographing and stereotyping equipment; also linotype machines.

Wis., Peshtigo—Thompson Bros. Boat Co.—additional metal and woodworking machinery for the manufacture of boats.

Wis., Stevens Point—Whiting-Plover Paper Co.—pulp beaters for addition to beater room at Plover.

Ont., West Flamborough—J. Stutt & Sons—lumber and saw mill equipment.

Que., Montreal—Machine Builders, Ltd., 738 St. Paul St., W.—printing, bookbinding and paper box machinery.

Que., Montreal—W. O'Brien, 600 Mullin St.—complete equipment for small foundry.

Metal Working Shops

Calif., Emeryville — The Westinghouse Electric & Mfg. Co., 1st Natl. Bank Bldg., San Francisco, is having plans prepared for the construction of a manufacturing plant on a 12½ acre site, here. Estimated cost $1,000,000. Engr. Dept. of owners, Union Bldg., Pittsburgh, Pa., Engrs. and Archts.

Calif., Fresno—R. Emirzian, 1002 T St., awarded the contract for the construction of a 1 story garage on Block 99, Lots 27 to 32. Estimated cost $39,765.

Calif., Oakland — The Union Press & Forge Co., Ford St. near Derby St., awarded the contract for the construction of a 1 story forge shop. Estimated cost $6,500.

Calif., Sacramento—The Sacramento Pipe Wks., R St. near 7th St., plans to build a plant consisting of 2 buildings, each 148 x 230 ft., on 16th and B Sts.

Calif., San Francisco—The Bothin Real Estate Co., 604 Mission St., awarded the contract for the construction of a 1 story ornamental iron works on Clementina St. between 5th and 6th Sts. Estimated cost $10,000. Kloeres & Koch, 943 Columbus Ave., lessees.

Calif., San Francisco—J. M. Carlson, 185 Stevenson St., awarded the contract for the construction of a 2 story electrical shop on Minna St. Estimated cost $9,000. Central Electric Co., 185 Stevenson St., lessee.

Calif., San Francisco—L. R. Lurie, Mills Bldg., has had plans prepared for the construction of a 1 story machine shop on 10th and Minna Sts. Estimated cost $15,000. O'Brien Bros., Inc., 240 Montgomery St., Archts.

Calif., San Francisco—S. C. Moore, 133 Kearny St., awarded the contract for the construction of a 1 story, 30 x 110 ft. plating shop on Folsom St. near 19th St. Estimated cost $5,000.

Conn., Fairfield—S. Lowe & Sons Co., 30 Sunfield Drive, awarded the contract for the construction of a 2 story, 45 x 80 ft. addition to its factory for the manufacture of sash pulleys. Estimated cost $25,000. Noted Nov. 16.

Conn., Hartford—Hartford Dispatch & Trucking Co., 105 Albany Ave., will build a 1 story, 40 x 80 ft. garage and machine shop. Estimated cost $40,000.

Conn., Southington—The Stanley Rule & Level Co., New Britain, will build a 1 story, 60 x 60 ft. addition to its forge shop on Sumler St., here. Estimated cost $15,000.

Ill., Chicago — The Fair Department Store, State and Adams Sts., awarded the contract for the construction of a 1 story, 157 x 313 ft. garage at 2454-2520 Lawrence Ave. Estimated cost $185,000.

Ill., Chicago—Ford Motor Co., Highland Park, Mich., is having plans prepared for the construction of a 1 story, 502 x 1,363 ft. assembly plant for automobiles on Torrance Ave. and Calumet River, here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Ill., Chicago—The Golden Rule Cutlery Co., Ogden and Sheldon Sts., awarded the contract for the construction of a 3 and 4 story factory. Estimated cost $20,000. Noted Nov. 23.

Ill., Chicago—Muehlhausen Spring Co., 5841 Loomis St., is receiving bids for the construction of a 1 story, 100 x 142 ft. factory for the manufacture of phonograph springs, at 5811-19 South Western Ave. Estimated cost $40,000. Newhouse & Bernhams, 4630 Prairie Ave., Archts.

Ill., Chicago—The Peoples Gas Light & Coke Co., 172 South Michigan Ave., is having plans prepared for the construction of a 2, 3 and 4 story meter repair shop on Homan and Division Sts. Estimated cost $300,000. H. Von Holst, 112 West Adams St., Archt.

Ill., Oak Park—The Madison Motor Co., 810 West Madison St., is having plans prepared for the construction of a 1 story automobile sales and service station at 811 West Madison St. Estimated cost $60,000. Weller & Rippel, 140 South Dearborn St., Chicago, Archts.

Ky., Louisville—The Louisville Garage Co. plans to build a garage and service station on 5th St. Estimated cost $100,000. Architect not announced.

La., Baton Rouge—Louisiana State University will soon award the contract for the construction of a power house, also for an engineering building, 325 ft. long, with 4 wings, each 100 ft. long. Estimated cost $130,000. R. L. Himes, Secy. Building Com.

Mass., Worcester—The Parker Wire Goods Co., 18 Grafton St., awarded the contract for the construction of a 1 story, 120 x 300 ft. wire goods manufacturing plant. Estimated cost $75,000. Noted Nov. 16.

Mass., Worcester — Reed & Prince Mfg. Co., Duncan Ave., awarded the contract for the construction of a 2 story, 60 x 400 ft. addition to factory for the manufacture of screw products, also a 1 story, 90 x 120 ft. annealing room on Nixon Ave. Estimated cost $150,000.

Mich., Detroit—The Michigan Stamping Co., 11631 Mack Ave., had plans prepared for the construction of a 1 story, 140 x 347 ft. addition to its metal stamping plant. Estimated cost $175,000. A. Kahn, 1000 Marquette Bldg., Archt.

Mo., St. Louis—The city, Bd. of Public Service, 208 City Hall, will receive bids until Jan. 2 for the construction of a 2 story, 54 x 225 ft. service building and power plant for St. Louis Training School for Feeble Minded at Scott Farm. Estimated cost $150,000. L. R. Bowen, 304 City Hall, Engr. and Archt.

Mo., St. Louis—F. L. Cornwell, La Salle Bldg., is building a 3 story, 78 x 155 ft. automobile garage and show room on Locust Blvd. Estimated cost $150,000.

Mo., St. Louis—J. Cusamano, 910 Carleton Bldg., awarded the contract for the construction of a 1 story, 127 x 192 ft. garage on 10th St. Estimated cost $40,000.

Mo., St. Louis—H. Foerster, 3539A Giles Ave., awarded the contract for the construction of a 1 story, 50 x 140 ft. iron works at 3907 Bingham St. Estimated cost $25,000.

N. Y., Blasdell—The Seneca Iron & Steel Co., Erie County Bank Bldg., Buffalo, plans to build a large addition to its steel and iron works on a 15 acre site, here. Cost will exceed $50,000. Architect not announced.

N. Y., Brooklyn—J. J. Aaron, c/o A. Goldberg, Engr. and Archt., 164 Montague St., will build a 1 story, 100 x 150 ft. garage on Montgomery St. Estimated cost $75,000.

N. Y., Buffalo—A. L. Dixon, 1034 Main St., plans to build a 2 story, 98 x 200 ft. automobile sales building and garage. Cost will exceed $40,000. Architect not announced.

N. Y., Buffalo—M. Finkelstein, 255 Amherst St., plans to build a garage and service station. Estimated cost $80,000. Architect not announced.

N. Y., Buffalo—The Swan Garage, Inc., 48 Swan St., awarded the contract for the construction of a 3 story, 91 x 115 ft. garage. Noted Nov. 16.

N. Y., New York—The Dept. of Parks, Municipal Bldg., is having plans prepared for the construction of a 4 story service building on 77th St. and Columbus Ave. Estimated cost $500,000. Private plans.

N. C., Gold Hill—The Rodrain Electro-Metallurgical Co. plans to build a complete gold mining plant. Estimated cost $500,000. Architect not announced.

O., Akron—The Ohio Pump & Machine Co., National Bldg., awarded the contract for the construction of a 1 and 2 story, 80 x 260 ft. plant. Estimated cost $50,000.

O., Alliance—The Machined Steel Castings Co., South Mahoning Ave., plans to build a 1 story, 75 x 200 ft. addition to its plant. Estimated cost $100,000.

O., Cleveland—G. W. Deming, 3154 Redwood Ave., and O. G. Deming, 1269 Carlyon Rd., Cleveland Heights (real estate), are having plans prepared for the construction of a 1 story, 40 x 73 ft. and 40 x 54 ft. commercial building and garage on Euclid Ave. and Chardon Rd. Estimated cost $40,000. H. P. Whitworth, 526 Hickox Bldg., Archt.

O., Cleveland—The Grabler Mfg. Co., 6565 Bway., manufacturer of plumbing supplies, awarded the contract for the construction of a 1 story, 50 x 80 ft. and a 3 story, 80 x 80 ft. annealing house and factory. Estimated cost $50,000. W. S. Bayer, Secy. Noted Oct. 5.

O., Cleveland—A. Mechanic, 7829 Carnegie Ave., manufacturer of automobile accessories, is having plans prepared for the construction of a 2 story, 33 x 37 ft. shop on East 82nd St. and Carnegie Ave. Estimated cost $25,000. A. Sogg, 319 Hippodrome Bldg., Archt.

O., Cleveland—The W. S. Tyler Co., 1430 East 36th St., awarded the contract for the construction of a 1 story, 40 x 60 ft. addition to its galvanizing plant. Estimated cost $10,000.

O., Cleveland—The Union Terminal Bus Line Co., c/o Miller & James, Archts., Erie Bldg., is having plans prepared for the construction of a 2 story, 72 x 180 ft. garage and service station on East 9th St. near Central Ave. Estimated cost $60,000.

O., Wadsworth—The Ohio Injector Co., c/o E. J. Young, Pres., is having plans prepared for the construction of a 3 story, 60 x 250 ft. addition to its factory. Estimated cost $150,000. Christian-Schwarzenberg & Gaede Co., 1900 Euclid Ave., Cleveland, Archts.

Pa., East Newport (Newport P. O.)—The Mineral Products Co. plans to rebuild portion of its roofing products plant, which was destroyed by fire. Estimated cost $25,000.

Pa., Fleetwood—The Down Tool Wks. is building a 1 story, 36 x 134 ft. and 24 x 37 ft. factory for the manufacture of high speed drills and tools, on Locust St. Estimated cost $10,000. W. R. Down, owner.

Pa., Phila.—The Franklin Sugar Co., 1045 North Delaware Ave., plans to build a 1 and 2 story machine shop and barrel house. Estimated cost $50,000. Private plans.

Pa., Phila.—C. J. Gilmore, Archt., Fuller Bldg., is receiving bids for the construction of a 1 story, 62 x 155 ft. garage on York Rd. and City Line Ave., for W. B. Margerum, York Rd. and Chelen Ave. Estimated cost $60,000.

Pa., Phila.—F. Nardy, 3840 Spring Garden St., is having plans prepared for the construction of a 2 story, 100 x 138 ft. garage on 18th and Jackson Sts. Estimated cost $80,000. R. A. Schuman, 202 West State St., Trenton, N. J., Archt.

Pa., Phila. — The Smith-Hardican Co., 1606 Cherry St., is receiving bids for the construction of a 4 story, 65 x 80 ft. garage on 20th and Brandywine Sts. Estimated cost $120,000. Private plans.

Pa., Pittsburgh—The Fairmont Creamery Co., 301 Ferry St., awarded the contract for the construction of a 1, 2 and 5 story, 62 x 72 ft. and 38 x 72 ft. sales warehouse and garage on 25th and Smallman Sts. Estimated cost $150,000. Noted Sept. 14.

Wis., Waupun—Landaal Bros. Co. plans to build a 1 or 2 story, 60 x 132 ft. garage on Drummond St. Estimated cost $50,000. Architect not selected.

Wis., Wausau—The Hall Garage Co., 107 Scott St., awarded the contract for the construction of a 2 story, 50 x 60 ft. garage. Estimated cost $40,000.

Ont., Bridgeburg — The National Brake Co., Ellicott Bldg., Buffalo, N. Y., plans to build a branch plant for the manufacture of brakes and equipment, here.

Ont., Collingwood—The Canadian Postal Lock Nut Bolt Co., plans to build a factory for the manufacture of bolts, screws, rivets and also for steel stamping, in the spring. Estimated cost $50,000. F. A. Bassett, Mgr.

Ont., Ford—Ford Motor Co. of Canada, awarded the contract for the construction of a 2 story, 100 x 400 ft. automobile factory on Riverfront St. Estimated cost $250,000. P. W. Grandjean, Secy.

Ont., Wiarton — G. Golden, Berford St., plans to build a garage and automobile repair shop. Estimated cost $45,000.

Pa., Warren — The Warren Garage Co. plans to remodel and build a 2 story addition to its garage.

Pa., Waynesburg — H. Cochrane, Dawson, will build a 2 story, 90 x 120 ft. garage on Greene St. Estimated cost $60,000.

R. I., Providence—G. Wolf, Archt., 88 Althea St., is receiving bids for the construction of a 2 story, 50 x 120 ft. garage on Pearl St. for Goldberger & Brody, c/o Archt. Estimated cost $55,000.

Tenn., Chattanooga — The Continental Mchy. Co., G St., plans to rebuild its plant for the manufacture of machinery, which was recently destroyed by fire. Estimated cost $200,000. Architect not announced.

Tenn., Memphis — The Fischer Heating Co., 51 South 3rd St., awarded the contract for the construction of a 1 and 2 story machine shop, industrial and heating plant, on a 75 x 150 ft. lot. Estimated cost $35,000.

Va., Nansemond (Suffolk P. O.)—G. D. Graveley, Richmond, plans to build a plant for the manufacture of auto tractors and agricultural equipment, here. Estimated cost $25,000. Architect not announced.

Wis., Eau Claire—K. N. Knudson, 307 North Farwell St., plans to build a 1 story, 55 x 94 ft. garage. Estimated cost $40,000. Private plans.

Wis., Eau Claire—The Paige-Ford Motor Car Co., Wisconsin and North Farwell Sts., plans to build a 2 story, 58 x 90 ft. garage. Estimated cost $45,000. Private plans.

Wis., Milwaukee—H. C. Hengels, Archt., 445 Milwaukee St., is receiving bids for the construction of a 2 story, 70 x 150 ft. addition to garage on Grand Ave., for the Welch Investment Co., 105 Wells St. Estimated cost $50,000.

General Manufacturing

Calif., Hayward—E. L. Macabee, Mgr. Hunt Bros. Packing Co., Lower B St., and Chn. of Cold Storage Plant Committee of Hayward Chamber of Commerce, backs movement to finance construction of cold storage plant. Will be constructed either by the formation of a local stock company or b ya corporation already established in Hayward. Estimated cost $100,000.

Calif., Oakland—The Art Rattan Wks., 475 Sutter St., San Francisco, plans to build a 3 story factory for the manufacture of rattan furniture on 24th Ave., here. Estimated cost $20,000.

Calif., Porterville—The Acme Ice Cream Co., 1313 Sansome St., San Francisco, has purchased a creamery plant, here, and plans to remodel and build additions to same, including an ice plant.

Conn., Bridgeport — A. V. Langenegger, 2190 Park Ave., is having plans prepared for the construction of a 3 story factory for the manufacture of corsets on Federal St. Estimated cost $150,000. Fletcher-Thompson, Inc., 542 Fairfield Ave., Archts.

Conn., Hartford—The Hartford City Gas Light Co., 565 Main St., plans to build a large addition to its gas plant. Architect not selected.

Conn., Hartford—The Hartford Courant, 64 State St., awarded the contract for the construction of a 2 story addition to its plant, to be used for a printing and mailing room. Estimated cost $50,000. Noted Nov. 23.

Conn., Westport—The Lees Mfg. Co., 320 Bway, New York City, is having plans prepared for the construction of a 3 story, 50 x 150 ft. addition to its cordage and twine factory, here. Estimated cost $75,000. Fletcher-Thompson, Inc., 542 Fairfield Ave., Bridgeport, Archts.

Ill., Chicago—The Douglas Bottling Co., 3523 Ogden Ave., awarded the contract for the construction of a 1 and 2 story, 75 x 145 ft. and 23 x 75 ft. bottling works on Ogden Ave. near South Ridgeway St. Estimated cost $40,000.

Ill., Chicago—D. P. Farrell, c/o M. O. Nathan, Archt., 123 West Madison St.,

awarded the contract for the construction of a 1 story, 100 x 200 ft. box factory at 4411 West Lake St. Estimated cost $40,000.

Ill., Chicago — The Olson Rug Co., 32 Laflin St., awarded the contract for the construction of the foundation of a 5 story, 84 x 187 ft. factory at 1514-20 West Monroe St. Estimated cost $250,000. Noted Oct. 12.

Ind., New Albany—The Period Cabinet Mfg. Co. plans to build an addition to its furniture factory. Estimated cost $25,000.

Md., Baltimore—The Air Reduction Co., 342 MadisonAve., New York City, is having plans prepared for the construction of an acetylene plant on Fayette St. ,here. Estimated cost $150,000. Francisco & Jacobus, 511 5th Ave., New York City, Archts.

Mass., Bridgewater—The Lapworth Webbing Co., Stoughton, will build a 1 story elastic webbing plant, here. Estimated cost $30,000.

Mass., Fall River—The Standard Oil Co., 26 Bway, New York City, awarded the contract for the construction of a 1 story oil plant, consisting of a 61 x 83 ft. garage, a 20 x 20 ft. pump house, a 30 x 51 ft. warehouse, storage tanks, etc., on Slade St., here. Estimated cost $50,000.

Mass., Lawrence — The Bellevue Monumental Wks., 64 Manchester St., manufacturer of marble monuments, will build a 2 story, 40 x 53 ft. addition to its plant. Estimated cost $20,000.

Mass., Millbury—The Samuel E. Hull Co., 112 Front St., Worcester, awarded the contract for the construction of a 2 story, 55 x 60 ft. shoddy mill, here. Estimated cost $25,000.

Mass., North Brookfield — The Asbestos Textile Co., Woolworth Bldg., New York City, awarded the contract for the construction of a 1 story, 30 x 50 ft. addition to its textile plant, here. Estimated cost $7,500.

Mass., Worcester—The Waldorf System, Inc., 169 High St., Boston, awarded the contract for the construction of a 1 story, 65 x 125 ft. bakery, commissary, etc., on Arch and Sumner Sts., here. Estimated cost, $40,000. Noted Oct. 5.

Minn., Duluth—The Blue Valley Creamery Co., 700 South Clinton St., Chicago, awarded the contract for the construction of a 2 story, 90 x 100 ft. creamery on Commerce St. and 12th Ave., W., here. Estimated cost $35,000.

Mo., St. Louis—The Broderick & Bascom Rope Co., 805 North Main St., awarded the contract for the construction of a 2 story, 81 x 496 ft. warehouse at 4233-35 North Union Blvd. and a 1 story, 143 x 496 ft. factory at 4239-51 North Union Blvd., also smaller building. Estimated cost $188,350.

Mo., St. Louis—The Grace Sign & Mfg. Co., 425 South Main St., plans to build a 1 story, 150 x 260 ft. sign factory on 2nd and President Sts. Estimated cost $100,000. Architect not selected.

N. Y., Alden—Bd. of Supervisors, Erie County, City Hall, Buffalo, is having preliminary sketches made for the construction of a 1 story, 75 x 100 ft. power house and refrigerating plant in connection with the new county home, here. Cost will exceed $40,000. W. A. Kidd, 524 Franklin St., Buffalo, Archt.

N. Y., Ashville—W. F. Meyer plans to rebuild cider mill which was recently destroyed by fire. Estimated cost $10,000.

N. Y., Buffalo—The Automatic Tire Machine Co., 19 Bush St., plans to build a factory for the manufacture of tire machines and appliances. Estimated cost $12,800.

N. Y., Geneva—City plans an election to vote on a $500,000 bond issue for the construction of a high school, including vocational department. C. W. Rice, Pres.

N. Y., Jamestown—The Six Hundred Gas Stations, Inc., 8th St., awarded the contract for the construction of a 2 story, 40 x 60 ft. gasoline distributing station on Monroe and 8th Sts. Estimated cost $25,000. Noted Sept. 28.

N. Y., New York—Harper & Bros., 333 Pearl St., will soon receive bids for the construction of a 5 story publishing building on East 33rd St. Estimated cost $800,000. Warren & Wetmore, 16 East 47th St., Engrs. and Archts.

N. Y., White Plains—Dentermann & Son Ice Co. is having plans prepared for the construction of a 1 story, 50 x 120 ft. addition to its plant. Estimated cost $65,000. L. Block, 501 5th Ave., New York City, Archt.

N. C., Cramerton—Mays Mill, Inc., plans to build a weaving mill addition to its plant for the manufacture of yarns into fancy finished colored goods, capacity 2,000 looms. Estimated cost $1,000,000. S. W. Cramer, Pres.

N. C., Lillington—The Cape Fear Gravel Pits, Inc., plans to build a large gravel production plant, also a plant for the manufacture of concrete building blocks and tile. Estimated cost $250,000. C. W. Lacy, Wilmington, Pres.

O., Cleveland—H. E. Roth, 1604 East 117th St., has had plans prepared for the construction of a 1 story, 50 x 100 ft. and 30 x 40 ft. hide factory, office and garage, on West 65th St. near Storer Ave. Estimated cost $50,000.

O., Wadsworth—The Ohio Match Co. is having plans prepared for the construction of a 3 story, 120 x 200 ft. factory. Estimated cost $150,000. Christian-Schwarzenberg & Gaede Co., 1900 Euclid Ave., Cleveland, Archts.

Pa., Allentown—The Trenton Poster Advertising Co., 725 East State St., Trenton, N. J., awarded the contract for the construction of a 1 story, 60 x 125 ft. poster advertising works, here. Estimated cost $20,000.

Pa., Bridgeport—James Lees & Sons Co. awarded the contract for the construction of a 5 story, 43 x 64 ft. textile mill.

Pa., Erie — The Record Publishing Co., 12th and French Sts., plans to build an addition to its printing plant. Estimated cost $9,700.

Pa., Lebanon—The Lebanon Honey Cake Cone Co. plans to build a 2 story factory for the manufacture of cones and byproducts. Cost will exceed $25,000.

Pa., Phila.—The Amer. Ice Co., 6th and Arch Sts., is receiving bids for the construction of a 1 story, 125 x 150 ft. ice storage plant on 17th St. and Washington Ave. Private plans.

Pa., Phila.—Bennett & Aspden Co., Krams and Pechin Sts., awarded the contract for the construction of a 3 story addition to its textile mill for the manufacture of upholstery. Estimated cost $80,000.

Pa., Phila.—Bush & Diamond, Jasper and Thayer Sts., awarded the contract for the construction of a 2 story rug mill on Ontario and Jasper Sts. Estimated cost $50,000.

Pa., Phila.—The Ketterlinus Lithographic Mfg. Co., 4th and Arch Sts., will receive bids Jan. 1 for the construction of an 8 story, 55 x 140 ft. printing plant. Ballinger Co., 12th and Chestnut Sts., Archts. Noted Nov. 23.

Pa., Phila.—The Rodgers Engraving Co., 1318 Arch St., awarded the contract for the construction of a 2 story printing plant on Camac and Cherry Sts. Estimated cost $27,000.

Pa., Phila.—The University of Pennsylvania, 34th and Woodland Sts., awarded the contract for the construction of a 2 story, 34 x 43 ft. laundry on 34th and Spruce Sts. Estimated cost $32,000.

Pa., Phila.—C. E. Wunder, Archt., 1517 Spruce St., is receiving bids for the construction of a 5 story, 173 x 200 ft. printing plant on 34th and Market Sts. for the Stephen Green Co., 15th and Arch Sts. Estimated cost $250,000.

R. I., Pawtucket—Bd. Educ. will soon receive bids for the construction of a 3 story manual training and industrial arts high school on Fountain St. Estimated cost $1,200,000. R. C. N. Monahan, 255 Main St., Archt.

R. I., Woonsocket — The Rhode Island Knitting Co., Jeffers St., will soon award the contract for the construction of a 2 story, 40 x 100 ft. addition to mill for the manufacture of knit goods. Estimated cost $50,000. Private plans. Noted Nov. 30.

R. I., Woonsocket—The Verdun Mfg. Co., Manville Rd., awarded the contract for the construction of a 1 story addition to its textile plant, a 32 x 44 ft. finishing mill and a 26 x 36 ft. garage. Estimated cost $7,500.

Tenn., Memphis—The DeSoto Hardwood Flooring Co., 1014 Sledge Ave., plans to build a 30 x 135 ft. addition to its plant, including dry kilns. Estimated cost $25,000. R. A. Taylor, Mgr.

Va., Front Royal—Proctors Grist Mills plans to rebuild its mill which was recently destroyed by fire. J. J. Proctor, proprietor.

Va., Richmond—The Corley Piano Co., 213 East Broad St., plans to rebuild its factory which was recently destroyed by fire. Estimated loss $235,000.

W. Va., Glen White—E. E. White Coal Co. plans to build a coal tipple. Estimated cost $50,000.

Wis., Crandon—F. H. Himes, plans to build a 50 x 65 ft. saw and planing mill. Architect not selected.

Wis., Eau Claire—The Lang Canning Co., Mill St., will build a 2 and 3 story addition to its cannery, consisting of a main factory, viner and husking buildings, boiler room, garage and sauerkraut factory. Estimated cost $120,000.

Wis., Hustisford — J. Hurley, Hartland, plans to build a 2 story, 75 x 150 ft. creamery and dairy, here. Estimated cost $50,000. Architect not selected.

Wis., La Crosse—The Anderson Vulcanizing Co., 215 State St., will build a 2 story, 30 x 50 ft. vulcanizing station. Estimated cost $15,000.

Wis., Madison—The Madison Supply Co., 615 East Washington Ave., is having plans prepared for the construction of a 2 story, 50 x 60 ft. bottling works and warehouse building. Estimated cost $40,000. R. A. Phillips 315 Beaver Bldg., Archt.

Wis., Madison—The Valvoline Oil Co., 815 East Main St., is receiving bids for the construction of 2 40 x 50 ft. filling stations, including oil storage tanks, pumps, etc., on Lakeside St. Estimated cost $40,000. H. R. Potter, Mgr. A. D. Conover, Tenny Bldg., Archt.

Wis., Milwaukee — The Excel Mfg. Co., 3402 South Pierce St., awarded the contract for the construction of a 2 story, 60 x 180 ft. addition to its mill work factory. Estimated cost $45,000.

Wis., Milwaukee—The Palmolive Co., 42 4th St., (manufacturer of soap) will build a 1 story, 50 x 50 x 80 ft. addition to its factory. Estimated cost $20,000.

Wis., Milwaukee—The Random Lake Ice Co., 064 Locust St., will build a 1 story, 100 x 125 ft. ice manufacturing plant on Walnut St. Estimated cost $50,000.

Wis., Neenah—The Kimberly-Clark Co. awarded the contract for the construction of a 2 story, 65 x 120 ft. addition to its paper mill. Estimated cost $50,000.

Wis., Plover—The Whiting-Plover Paper Co., Stevens Point, awarded the contract for the construction of a 3 story, 40 x 108 ft. paper factory unit and beater room, here. Estimated cost $50,000. E. A. Oberweiser, Mgr.

Wis., Random Lake—The Krier Preserving Co., Belgium, is receiving bids for the construction of a 1 and 2 story, 50 x 240 ft. cannery, consisting of a main factory, warehouse, sheds and power house, here. Estimated cost $100,000. Private plans.

Wis., Sheboygan—The Vulcan Last Co., Crandon, plans to build a 2 story, 75 x 125 ft. shoe factory, here. Architect not selected.

Wis., Wausau — Oppenhamer & Obel, Archts., Spencer Bldg., are receiving bids for the construction of a 3 story, 50 x 180 ft. shoe factory for the Marathon Shoe Co., 1st Ave. and Cedar St. Estimated cost $60,000.

Wyo., Rawlins—The Producers' & Refiners' Co., Caspar, awarded the contract for the construction of a refinery, 10,000 bbl. capacity, on a 2,800 acre site, here.

N. B., St. Johns—The Stephen Brick Co., Prince William St., plans to rebuild its plant which was recently destroyed by fire. Estimated cost $100,000.

Ont., Goderich — W. Baechler plans to build a woodworking plant and sawmill. Estimated cost $50,000.

Ont., Lindsay—The Gull River Lumber Co. plans to build a dry kiln and lumber warehouse.

Ont., Owen Sound — Bd. Educ., W. H. Wright, Chn., awarded the contract for the construction of a 3 story, 100 x 300 ft. technical school on 5th Ave. Estimated cost $200,000. Noted June 8.

Ont., Petrolea—B. P. Corey plans to build factories for the manufacture of grease, oil and gasoline, also tanks for storing raw materials. Estimated cost $100,000.

Ont., Rannoch—W. Zurbrigg, c/o J. H. Jameson, St. Marys, plans to build a saw and planing mill, here. Estimated cost $25,000.

Ont., Stratford — Stratford Frames & Novelties, plans to vote on by law in January for the construction of a factory for the manufacture of various lines of woodwork. Estimated cost $50,000.

Ont., Toronto—Lawrason & Doughty, 42 Church St., awarded the contract for the construction of a 4 story, 80 x 100 ft. paper carton factory. Estimated cost $150,000.

Ont., Welland—The Welland Cotton C. having plans prepared for the construction of a 1 and 2 story, 100 x 350 ft. cotton mill on Bergar St. Estimated cost $250,000. J. T. Grantham, Pres. Private plans.

Que., St. Hyacinthe — Penmans, Ltd., Paris, Ont., is having plans prepared for the construction of a woolen mill on Girouard St., here. Estimated cost $100,000. J. M. Moore, 489 Richmond St., London, Ont., Archt.